Spatial analysis of housing markets with land rent theory of political economy: the cases of London, Seoul and Los Angeles

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Abstract

This study adopts Marxian land rent theory as a framework to understand the structure of house prices with explicit attention to labour reproduction in an urban context. It attempts to correct the misunderstandings in Marxian land rent theory and develop it for an urban context. The four categories of land rent of differential rent, differential rent 2, absolute rent, and monopoly rent are critically re-examined. Subsequently, the combination of absolute rent and differential rent is suggested as a general structure for land rents in an urban context. The dynamic mechanism of changes in land rents is explained with the concepts of *emulation*, *differentiation* and *shift between groups of houses* based on the structure of land rents. The process of the formation of housing submarkets has been examined for a practical preparation for empirical analysis and a theoretical basis for the subdivision of the housing market. Spatial submarkets are identified by focusing on the interactive relationship between *residential spheres* (a unit consisting of a centre of employment and the surrounding residential area). Sectoral submarkets are defined based on social and environmental features as well as the structural features of dwellings. For empirical analysis, three metropolitan cities were chosen: London as monocentric, Seoul as tri-centric and Los Angeles as polycentric. Empirical analysis has used commuting patterns and the contours of house prices as the criteria to identify spatial submarkets with the help of network analysis and GIS. Simple OLS regression analysis of house prices on the accessibility to centre was conducted in each identified submarket. The results were used to explore the structure of and the dynamic changes in land rents. A consistent structure of land rents was observed in each housing submarket across all three cities. The implication on the condition of labour reproduction was drawn out by interpreting the changes in land rents over a period of 10 years in each city. The analysis of London revealed a monocentric housing market structure and the suitability of commuting time over physical distance as an accessibility variable. In Seoul's case, the transition from tri-centric to monocentric housing market was observed and a comparative approach with rent and price data enriched the interpretation of the changes in the structure of the housing market. The impact of social and environmental features of the neighbourhood, such as class, ethnic concentration and negative externality, on house prices was highlighted in the analysis of Los Angeles.

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Chapter 1.

Introduction

1-1 Background

The world economy is in the crisis of a global downturn, which was triggered by bad loans on subprime mortgages in the United States prior to 2008. In order to improve confidence in the market, most governments in the major economies initially conducted expansionary fiscal and monetary policies in an unprecedentedly collective way. With slow recoveries despite the dropping interest rate and the huge budget deficit, many major economies are becoming exposed to the possible crisis of a 'double-dip' recession. The fiscal crisis in Greece, along with California, Portugal, Italy, and Spain in 2010 alerted the governments to the possibility of even worse economic disaster. Although debates are ongoing over the best policy to follow, many governments are announcing austerity measures to reduce their budget deficits. The expected public sector spending cuts are threatening a large proportion of the population, so the tensions between the governments and the ordinary people are mounting.

In identifying the causes of the crisis, the operation of financial markets, particularly their reckless creation of, and investment in, derivatives such as mortgage backed securities have been criticised; there has therefore been strong argument for stricter regulation on the market. On the other hand, it has been argued that the fundamental innate problem of capitalist accumulation has been exposed, or an attempt to verify the long-term relationship between the business cycle and the price of land has been made. Although all the arguments contribute to a fuller understanding of the crisis, this global crisis demands a better, more convincing theory which not only addresses the core problem of the system but also entails detailed analysis.

One of the causes of the crisis is investment and bad loans on mortgages in the housing market based on the soaring house prices in major economies which were predicted to continue unabated. The soaring house prices contributed to an increase in consumption of households with the wealth effect and the growth of profit margins in the financial sector let alone the boom in the construction industry. The combination of overheated demand for houses and widened accessibility to financial products of mortgages which is also based on the expectation of increasing house prices eventually results in an increase in household debt. Household bankruptcy ignited by external factors, such as oil price surge, was doomed to bust the bubble in house prices with insolvencies in financial sector. The fall in purchasing power and the stricter accessibility to mortgage products due to the insolvencies in the financial sector led to the fall in house prices and successively resulted in a further insolvency in the sector. This vicious spiral has been claimed to be one of the reasons of the current form of the economic crisis.

To find the reason behind the changes in house prices across countries is an important part of figuring out the whole picture of this economic saga. The understanding is also important for the authorities in planning and housing to take relevant policies in response to the changes. A large scale provision of housing stock in the outskirt of cities or the growth of subcentres often results in an increase in house price contrary to the expected stabilising effect. It implies that the housing prices cannot be properly explained by mere supply-demand relations.

This study started from a question about the lack of any fundamental explanation by current mainstream neoclassical urban economics for the changes in house prices, in spite of its simplicity and the considerable power of description available to it. An imperative to understand the fundamental mechanisms underlying the movement of house price and the capital investment within the built environment has directed this study towards an understanding of land rent as the root of an alternative to the current mainstream theories on the housing market.

Land rent as one of the major components of payment for using a piece of land is intrinsic to various urban phenomena, including city expansion and regeneration under capitalism. Every part of land in an urban area is related to land rent as the relationship between landowners and users. The fact that land is a fundamental precondition for production causes producers to obtain use rights over a portion of the globe and to pay rent in return. The level of land rent would then be partly determined by the degree to which the usage of a piece of land contributes to create profit from production. For this reason, the analysis of land rent focused on the production process on land in classical political economy.

The land rent theories of classical political economy began with the analysis of agricultural land and the production process on the land. This emphasis on the production process was the fundamental basis in the land rent analysis of Johann Heinrich von Thünen, Henry George, and Karl Marx although most of their work was focused on agricultural land. Since then, however, the development of land rent theory has diverged changing its focus.

In the process of establishing an urban land rent theory, neoclassical urban economics has built upon the theory of von Thünen at the expense of maintaining the production relationship.

Instead, it has developed the concepts of utility and competition. With a demand-oriented approach, it has succeeded in explaining various urban phenomena in relatively clear and simple terms. However, it has some limitations in explaining the processes underlying the competition and utility to which they have attributed all urban phenomena. The comment of Ball (1985) on these limitations is relevant here: "Yet competition by itself does not explain very much. The ways in which production takes place on land must also be considered because production relations structure the conditions under which competition over land use takes place." (Ball 1985:503)

'Georgist' researchers who follow the theory of Henry George focus on how to levy windfall gain from land development. They are more interested in justifying a tax levying scheme using macro economic analysis to reveal the adverse effects of an increase in land prices and the possible effects on the whole economy of a tax scheme on land than in the structure of land rent and its mechanism.

The development of land rent theories after Marx has been relatively limited due to several reasons, although it has maintained a focus on the production relationship in land rent. First of all, there have been some crucial misunderstandings of the basic concepts and therefore exhaustive arguments over definitions. Secondly, the analysis of the mechanism of land rent has been relatively neglected, compared to an overwhelming degree of interest in the issue of social relations around land and the economic role of rent[1]. It is undeniable that the arguments about these issues have brought meaningful results, such as the role of built environment as a temporary shelter of accumulation of capital using the concept of the secondary circulation (Harvey 1982) and the importance of the historical and institutional contexts in land rent theories (Ball 1985). However, there has been little progress in the analysis of the mechanism of land rent. The theory about the structure of land rent and its mechanism can be the basis of further development of the theories about the social relations around land and the economic role of land rent. The fact that the analysis on the mechanism of land rent so far failed to support and fortify the other two issues of the social relations around land and the economic role of land rent could be one of the reasons for the general ebbing of Marxian land rent theory. The lack of empirical research into Marxian land rent theory is another cause of the decline. Haila (1990) criticised this point: "Instead of pursuing a theory applicable to modern conditions, rent scholars have persisted in recycling the old canons and appealing to the classical authorities.

[1] Haila (1990) classified land rent theories into three main categories: 1) the mechanism of land rent emerger 2) the social relations around land 3) the economic role of land rent.

The theory of land rent seems to have been an article of faith rather than a dynamic tool for empirical research …" (Haila 1990:275)

This study tries to develop land rent theory for an urban context without losing the fundamental basis of the production relationship. It also aims to verify it in empirical analysis of housing markets in different contexts. The reviewed land rent theory will be applied to an empirical analysis of the housing markets in the three cities of London, Seoul, and Los Angeles. The different spatial structure of cities requires relevant analysis on the division of housing submarkets. A theoretical and empirical examination of the policentric feature of urban structure for the division of housing submarkets is another aim of this study. A development of land rent theory for an urban context will contribute to complement the explanations of the fundamental structure of house prices. I hope the revival of an old theory can bring a fresh view on the structure of land rents and house prices filling the gaps in the current research on housing market. Furthermore I hope this research sparks many related debates and thus contributes to a further understanding of the interwoven relationship between labour reproduction, house prices, and the economy.

1-2 The structure of the thesis

The following first three chapters will provide a theoretical basis for the analysis of the structure of land rent in an urban context. Chapter 2 reviews the progress of existing theories on land rent, from pre-classical economists to recent debates. The examination of recent debates on land rent is focused on Marxian land rent theories. Chapter 3 attempts to correct the misunderstandings related to Marxian land rent theory and develop it for an urban context. The four categories of land rent are critically re-examined. Subsequently, a general structure of land rent in an urban context is suggested and the dynamic mechanism of changes in land rent is explained. Chapter 4 provides, not only a practical preparation for empirical analysis, but also a theoretical basis for the subdivision of the housing market into submarkets. Spatial housing submarkets are identified by focusing on the interactive relationship between commuting to employment centres and rents in the surrounding residential areas. While structural housing submarkets are identified by the physical properties of houses, sectoral housing submarkets are defined based on social and environmental features of neighbourhood as well as the structural features of houses.

The next three chapters provide an empirical analysis of the structure of land rents in the three cities of London, Seoul, and Los Angeles. Chapter 5 investigates the structure of land rent in London, which has a monocentric structure, Chapter 6 examines the structure of land rent in Seoul, an example of a tri-centric structure, and Chapter 7 highlights the structure of land rent in Los Angeles, which has a polycentric structure. In these three chapters, commuting patterns and the shapes of house prices are used as main criteria to subdivide spatial housing submarkets. By spatial and sectoral housing submarket, a simple OLS regression analysis of house price on the accessibility to the centre of each spatial submarket is conducted. The result from the analysis is used in diagrammatic analysis to explore the structure of land rent and the dynamic changes in land rents in all three cities. In Chapter 5, two measures of physical distance and commuting time are used as a measure for accessibility. In Chapter 6, rent data as well as price data enriches the interpretation of empirical analysis in Seoul. Chapter 7 highlights the impact of social and environmental features of neighbourhood such as class, ethnic concentration and negative externality on house price in Los Angeles. A brief summary of the theoretical development in the structure of land rents and housing submarkets and findings in empirical analysis follows in the conclusion Chapter 8 with comments on limits of the study, future studies and policy implications.

Chapter 2.

Literature review

Examining existing work on land rent is an essential prerequisite for any further development in the theory. In this literature review, the contributions in Marxian land rent theory will be examined with explicit attention to the mechanism of land rent. Firstly, the formation of Marxian land rent theory is highlighted in the context of classical political economy. Secondly, the contributions in the rise and the ebb of the Marxian land rent theory in post-Marxism period are reviewed. Based on this, the reasons of the decline are examined. Thirdly, neoclassical approaches to Marxian land rent theory and recent discussion in the theory are reviewed. Implication for further development of the theory is extracted from this.

2-1 The formation of Marxian land rent theory

Marxian land rent theory is inseparable to the theory of classical political economy as his whole theory does. It is an irony that an attempt to criticize the 'vulgar economy' has contributed to synthesize it ever more consistently. His land rent theory also contains all aspects classical political economists argued. The origin of Marxian land rent theory thus could be sought from classical political economy, which is also indebted to the advances by pre-classical economists and Physiocrats.

Pre-classical economists like William Petty (1623~1687) and Richard Cantillon (1680~1734) regarded land and labour as the only two sources of wealth (Ghosh 1985). In the process of unfolding his economic system theory, Cantillon developed the concepts of 'natural state' and 'natural price', which can lead to a situation where income and expenditure flows are balanced and the price is determined in that state. This theory prefigures Smith and Marx on value and price (Cantillon 1755).

François Quesnay (1694~1774) and Jacques Turgot (1727~1781), physiocrats who emphasised the importance of agriculture, formulated their theory without including capital. According to their theory, there are three major classes in the economy: the 'productive' class of agricultural labourers and farmers, the 'sterile' class of industrial labourers, artisans and merchants, and the 'proprietor' class of landowners who appropriate the whole surplus as rents.

Like Cantillon, they thought that agricultural labour on land was the only source of wealth. Between land and labour, they emphasised the importance of land, seeing rent as the entire surplus of output over wages from agricultural labour and other production costs (Ghosh 1985). Thus, their theory has no role for capital in production on land and the conditions under which rent arise are not fully examined. Physiocrats like Quesnay are often regarded to have enhanced the concept of differential rent even before James Anderson and David Ricardo (Berg 2000).

It was not until the late 18th century, when Adam Smith (1776) and James Anderson (1777) were working on their theories, that capital became a main concern among the rent theorists. Before and even after the 18th century rent theories focused on the relationship between land and labour, and are mainly based on the agricultural sector.

How rent is determined was not among the main concerns of economists until the role of capital became focused and the existence of other elements of surplus was accepted. Adam Smith (1723~1790) was the first theorist who handled land rent within the framework of a capitalist agriculture (Ghosh 1985). Smith's rent theory is often regarded as inconsistent and self-contradictory. He failed to classify and identify properly each type of rent. He used the general term 'rent' for all types of rent, disregarding the differences in their origins, which led to confusion among readers and later researchers. Nevertheless, Smith rightly suggested that the premise of rent arising was due to the existence of landed property demanding rent. More specifically, he explained that rent arises because of the existence of monopoly, differential advantage in production, and bounty of nature, i.e. scarcity (Gee 1981). In addition, he tried to explain the rent gap between unimproved land and land that had been improved by capital investment (Brewer 1995). Moreover, his ideas about rent in urban contexts were quite brilliant. He not only argued that transportation development would decrease differential rent by location difference, but also distinguished ground rent as abnormal excess over normal profit, differentiating it from building rent, which is normal profit from capital investment on buildings with depreciation costs[2]. What is most impressive is that he clarified the main characteristics of rent using the concept of 'natural' rent. Like the concept of 'natural' price, which is determined when a commodity is sold at its price of production including cost price and normal profit, 'natural' rent is what the farmer can afford to pay in equilibrium, which is the excess of the value

[2] The term 'ground rent' is more widely understood as the specific rent that leaseholders' regular rentcharge to freeholder on long lease contract of land in the UK and many other countries these days. However, 'ground rent' in this study hereafter means land rent as abnormal excess over normal profit from land excluding 'building rent'.

of output over the tenant's cost, including profit at the normal rate on the tenant's investment. With this concept he clearly demonstrated that rent of all kinds is surplus profit.

The first economist who systematically developed the differential rent theory perceiving the effect of fertility difference on production was James Anderson (1739~1808) (Berg 2000). Postulating that the price of an agricultural product is determined by the price of production in the worst quality land, he proceeded to suggest that 'rent is in fact nothing else than a simple and ingenious contrivance for equalising the profits to be drawn from fields of different degrees of fertility' (Anderson 1777). Lower production costs on superior quality lands yield excess profit to the cultivator, and so landowners of the lands demand rent for that excess. This is an extensive differential rent. However, Anderson failed to proceed onto the theory of intensive rent, which arises because of successive capital investments on the land, because he didn't accept the concept of diminishing returns from land.

This rent theory, which has its basis in the different levels of fertility of different pieces of land, became the main concern among classical economists like Robert Malthus (1766~1834) and David Ricardo (1772~1823). Although Malthus accepted the logic of differential rent, he argued that there is no land yielding no rent, because every land has absolute fertility bestowed by God. He focused on the 'productive' powers and concluded that rent becomes a part of the production cost. This argument led to a famous debate on the Corn Laws with Ricardo, who believed that rent is determined by the market price of an agricultural product. Although Malthus's explanation of the rent as a part of production cost is irrelevant, this argument influenced the development of the concept of absolute rent by Karl Marx (1818~1883).

David Ricardo had systematically developed Anderson's rent theory. While the Physiocrats and Malthus thought that rent came from the unique productive powers of the land, Ricardo attributed it instead to the scarcity of land (Ghosh 1985). This led him to argue that each piece of land has relative fertility and that non-rent-paying land could theoretically exist, which is directly opposing Malthus's idea. Free access of capital across industries delivers a rate of profit even to capitalists in the agricultural industry, so rent is determined as it equates a differential surplus due to the differential fertility across different pieces of land. Therefore, in his theory, it is the worst land that regulates the market price of agricultural produce, because its production cost is the most expensive and thus bears no rent. In addition, he highlighted the existence of intensive differential rent with diminishing returns from land, which Anderson omitted from his theory. With successive investment on the same land, a capitalist can increase the productiveness of land, for example through improving its fertility, and the surplus from the investment can form the other type of differential rent, intensive differential rent. Ricardo explained rent using the concept of competitiveness both between capitalists and landowners and capitalists in a production process on the land. Now the role of capitalist entered as a major factor.

The work of Johann Heinrich von Thünen (1780~1850) which is the root of neoclassical urban economics originated from his work which first appeared in 1826 and was completed by 1863. In his rent theory, which is known as location theory in agricultural context, von Thünen focused on location and transport in a state comprising a city and its hinterland. While the Physiocrats and other classical economists perceived the difference between lands' fertility, von Thünen was the first economist who emphasised the importance of difference in location, which is especially important in an urban context. He started the theory from the locational equilibrium, a concept which implies that every farmer would take normal profit regardless of location of land they cultivate. Profit in a certain production is determined by a balance of the market price over transportation cost, other production costs, and rent. If transportation cost varies by location and the other production cost is not affected by location, the level of rent which a farmer can afford to pay entirely depends on the location of the land. With this emphasis on location difference, a farmer was regarded as an active subject with the ability to exert rationality like a landowner. At the same time, a decrease in the importance of the role of landowner has accompanied a decrease in the focus on rent being surplus. In addition, the conflict between the landowner and the capitalist and the dynamic activity of capitalist for extensive or intensive differential rent was neglected in this theory. Nevertheless, its ability to be applied in various ways (e.g. its application to multiple types of product of the land) by introducing a simple proposition is an undeniable contribution to the development of urban rent theory.

Karl Marx is a political economist who tried to complete the theory of political economy so that he could criticise it more fundamentally. Focusing on the relationship between labour and capital, he found that labour is a product which cannot be produced but instead reproduces itself with wages determined by an exploitative employment relationship with capitalists, so all surplus value is originated from this unequal exchange of labour and wage, where labour is exploited. In the relationship between land and capital he also made a remarkable achievement. He consistently synthesised all the issues and debates which had hitherto remained unsolved among classical economists. Firstly, he adopted the Ricardian differential rent theory. Although there are some methodological differences with Ricardo's analysis of intensive differential rent (Ball 1977, Evans 1992, Ball 1992), and Marx denoted it as differential rent 2, it is undeniable that Marx had adopted Ricardo's theory. He also integrated the rent theory of J. S. Mill with his explanation of differential rent 2. In this explanation, the excess profit from additional investment on land, which was often misunderstood as interest from the investment, is instead defined as differential rent 2, which eventually transforms into differential rent because the invested capital becomes a permanent part of the productivity of the land. Marx's unique contribution, though, is the theory of absolute rent, which is demanded even from the tenants of the worst land and which thus becomes a part of the price of production, which has remained controversial even until now. By suggesting the existence of minimum rent due to the power of landed property, he tried to end the debate between Malthus and Ricardo over whether rent is a part of the price of production or just a residual surplus. According to Marx, the two main elements of rent are differential rent, which is residual after production, and absolute rent, which becomes a part of the price of production. Besides these, he hinted, existed a temporary category of rent from a genuine monopoly price "determined by neither by the price of production of the commodities nor by their value, but rather by the demand of the purchasers and their ability to pay".(Marx 1991:898) In this way, he combined various theories on rent, developed after Adam Smith, into a consistent theory, although there is still some space open for further development.

2-2 Renaissance of Marxian land rent theory

Marxian land rent theory was almost neglected as neoclassical economics dominates. It was not until 1960's that the interests in Marxian land rent theory have been revived due to post-Marxism and soaring land and house prices. The renaissance lasts less than two decades. Haila (1990) summarised the period into three phases of consensus, transition and rupture. As Haila (1990) points out, the main interest in the early renaissance was absolute rent and monopoly rent.

Harvey and Chatterjee (1974) tried to show how absolute rent can be realised in the housing market of large metropolitan areas, based on empirical research on Baltimore city. They show there are multiple housing submarkets of absolute urban spaces in Baltimore, which were formed by social, institutional (governmental and financial), and geographical features. In each housing submarket, they argue, levels of absolute rent are structured by different levels of tension between social classes, which creates groups of different interests around housing, such as tenants, building owners, and developers. They found that there are two dimensions operating in the formation of absolute rent. One is structured by opposing forces within a housing submarket, and the other by interactions between housing submarkets. The first dimension assumes that the expansion of a housing submarket can help to reduce rents as supply of similar spaces increases. At the same time, they also point out the possibility of a shift of landowners to the other housing submarket, who will change their types of space when they face a low rate of return from their existing spaces. Research and empirical data on the existence of multiple levels of absolute rent organised by groups of space in an urban area is unusual in the related field of research. This therefore represents an exceptionally significant achievement for the subsequent analyses of spatial aggregation of residence and the dynamic mechanism of capital movement around built environment especially in residential areas.

Harvey (1974) developed the concept of "class monopoly rent" to explain the power of landowners over rent that results from the scarcity of limited resources. Quoting the remarks made by Ricardo that absolute rent could not exist except for the extreme case where there is absolute scarcity, like on an island, he suggests that the existence of absolute rent is more plausible in an urban context, where "there are a series of man-made islands on which class monopolies produce absolute scarcities". Although he does not try to resolve some problems related with Marx's concept of absolute rent here, his theory of "class monopoly rent" is employed as a similar concept. With this concept, he especially focuses on the class conflict between a class of owners of "resource units" and a class of lessees, who have to use land. He seems not to be particularly interested in finding out the economic basis of the cause of the rent. He points out that consumer preference in property market is systematically produced by the class of owners of "resource units" rather than arising "spontaneously". He succeeds in explaining the increased possibility of absolute rent in an urban context with the concept of "class monopoly rent" focusing on the class struggle between the lessor and lessee of urban space. However, his view on the lease of space in an urban context as a consumption process impedes a wider interpretation of space as a factor of which ordinary workers actively reproduce their labour power.

Walker (1976) suggests that the Marxian categories of rent of "absolute rent", "monopoly rent" and "redistributive rent" are important in explaining the contemporary urban process, criticising the neoclassical method of explaining rent as a universal rent. He rightly stresses the importance of the production phase in explaining rent and tries to develop the Marxian categories of rent in an urban context. His unique contribution of the concept of "redistributive rent" focuses on the government's role in creating rent by public spending on infrastructure or legislative activities. This emphasis of the government's role in changing rent in an urban context is appropriate and is one of the core facts that related research should consider. Nevertheless it can hardly be assumed to be an independent category of rent. It is more appropriate to regard that it influences the levels of existing types of rent.

The main concern of Edel (1975) is focused on monopoly rent which is regarded to be prevalent in an urban context. Introducing some arguments over conditions for the existence of absolute rent, such as low organic composition of capital and the collective barrier of landed property in urban context, he seems to conclude that these conditions can be met in an urban context. In drawing a distinction between absolute rent and monopoly rent, he argues that while both stem from the existence of barriers to equalisation of the rate of profit, the scales of the applicable sector of the two rents are different. He argues that absolute rent is applied for 'a level affecting all of a large sector (agriculture, urban areas in general)' while monopoly rent is applied for 'specific, detailed land uses' by 'racial minorities, immigrants and other subgroups'. Emphasising a detailed analysis by each group rather than a generalised analysis of urban rent as a whole, he agrees with the way in which Harvey and Chatterjee (1974) tried to explain their findings, but suggests that the different levels of rents of the multiple level of groups of residence by social, institutional, and geographical features should be regarded to be, not "class monopoly rent", but instead monopoly rent. A similar criticism of Harvey's position can be found in the works of Basset and Short (1980:201) and King (1987:210). However, Harvey's "class monopoly rent" is a possible form of absolute rent in an urban context, as Harvey (1974) admits. It is because the universal rent of "class monopoly rent" in a group of spaces is a rather structural factor in the cost of the usage differentiating itself from a temporary monopoly rent created by users' capricious preference and ability to pay.

A vast review of French literature on land and land rent was carried out by Scott (1976). Some of the works done by French researchers are worth being introduced again here with Scott's view on absolute rent. Emmanuel (1969) contributes to make the concept of differential rent easier to understand, with his unique supply and demand diagram. Emphasising the existence of groups of lands which have different production costs, he utilises a stepwise increasing supply curve rather than a smoothly increasing supply curve. This method of explanation is consistent with the concept of producer surplus in welfare economics. Walras (1896) who is famous for his theory on general equilibrium, contributes to the issue of price of land. The traditional concept of land price as a capitalised rent was $p = \lambda/\varrho$ where p land price, λ rent, ϱ general rate of profit or interest. Walras found that in a progressive society, rent tends to increase, while the general rate of profit tends to decrease, so the price of land would increase by time. Scott describes this as "a valuable exposition of one aspect of the fundamental nature of land speculation". An interesting view of land is also introduced . "Walras (1896) … proposes that the State abolish private ownership of land, and, moreover, that the State simultaneously abolish all taxes, and restrict its own revenue to the income from the expropriated land. … The State would maximize its revenue by offering to lease land to whoever offered to pay the highest rent. The allocative benefits of the market land would flow directly to the benefit of the collectivity." (Scott 1976:115) This idea resembles that of Henry George. On the controversial issue on absolute rent, Scott raises two questions. The first concerns why landlords restrict the level of absolute rent to value minus production price. He seems to believe that if they could appropriate the amount of value over production price, there is no reason that they could not charge more. The second question concerns on what basis landowners can be a barrier to the process of the equalization of the rate of profit. He negates the possibility of a cartel of landowners: "the real economic and political power of landlords in modern capitalist society is probably fairly negligible", "land lords in modern capitalist society do indeed impose a general levy of some kind on land, but this levy is really a rent on the global scarcity of land, rather than an absolute rent in the strict and technical sense of that term." (Scott 1976) Scott concludes that scarcity rent rather than absolute rent is likely to exist in an urban context.

Fine (1979) and Murray (1977, 1978) stands for Marx's original explanation on absolute rent focusing on the economic situation of the early stage of capitalism. Focusing on the relationship between differential rent 2 and absolute rent, Fine (1979) tries to show the consistency of Marx's rent theory in terms of value theory. After introducing the basic concepts of individual value, market value, and price of production, which are crucial to understanding Marx's theory of value, he stresses the importance in analysing rent theory of the separation of competition within a sector and competition between sectors. He points out that source of differential rent in the agricultural sector is the difference of individual values and market value in the sector before the equalisation of profit, in contrast to Ricardo's theory. For absolute rent he accurately interprets Marx's explanation, noting that the source of absolute rent is the difference between market value and price of production after the equalisation of profit across all sectors. He provided an explanation of why the amount of AR cannot exceed the difference between the value and the price of production of the product in the agricultural sector in the early stage of capitalism where capitalists' investment is limited within the sector. In this condition of limited movement of capital, the level absolute rent from investments on the new(worst) lands depends on the level of differential rent 2 from successive investments on existing lands. This explanation by Fine might be a good answer to the question raised by Marx himself, "if landed property gives the power to sell the product *above* its cost-price at its *value*, why does it not equally well give the power to sell the product *above* its value, at an arbitrary monopoly price?"(Marx 1968:332). On differential rent 2, he also correctly points out its temporary nature, as it ultimately transforms to differential rent. His contribution to interpreting Marxian land rent theory is one of the most detailed and correct attempts, despite the fact that it is limited to the discussion of the agricultural sector only. Although he interprets and analyses Marx writing on rents properly, he did not consider the possible errors in the original arguments of Marx, which will be discussed in the following chapter.

The most substantial contribution of the work done by Murray (1977, 1978) is the debate over the conditions of absolute rent. He uses his work to defend Marx's theory against the criticism. Firstly, he summarises the existing criticism of Marx's theory of absolute rent. The main and most common criticisms according to Murray are 1) excess profit, the source of absolute rent, can be higher or lower than the difference between value and price of production. Why then did Marx assume that the products in the land are sold at value not price, as according to Marx, the level of absolute rent is determined by supply and demand - so why should the upper limit of absolute rent be the difference between value and price of production? 2) if there is a barrier in the agricultural sector that restricts the inflow of capital, why are products sold at a level of value which assumes a mixture of all surplus values in the process of the equalisation of rate of profit? 3) is a low organic composition of capital an essential condition for absolute rent? Considering the first criticism, commenting on the transformation problem between value to price, Murray insists that price oscillates around the gravitational centre of value so that monopoly price is a rather accidental and temporary economic situation which will be disappear soon to be replaced by an increase in the following supply. However, as he himself emphasised in his later work in 1978, the non-reproducible characteristics of land as an essential factor in production make the monopoly price created in abnormal economic situation rather permanent with fluctuating feature. Considering the second criticism, he defends Marx, noting that a historic feature of landed property and the immobility of capital in the early stage of the capitalist mode of production enables the systematic block of capital and the exchange of products at their values. However, all the rent theory Marx developed is based on the capitalist mode of production, which is neither necessary nor sector-specific in an early stage, so the fact that products are exchanged in a market self-evidently shows that the value the sector produced has already mixed with other values from all other sectors. Moreover, blocking the inflow of capital is theoretically and practically an impossible situation, as capitalists would regard absolute rent as just a single factor of cost and move around searching for higher profit in the contemporary capitalism with ever greater mobility. Considering the third criticism, he argues that increasing capital investment on land would reduce the landowner's share of what was produced in the space leading to a reduction of the power of landownership and the disappearance of absolute rent as he described it as 'capital's subordination of the soil'. However, this is insufficient answer to the raised question.

There has been little disagreement on the concept of differential rent in the period as Haila (1990) pointed out. It is partly because the interests in differential rent were overshadowed by the interest in monopoly rent and absolute rent. There are few contributions which discuss the rent in an urban context. Harvey (1982) he has offered a significant insight into urban differential rent. That is the savings in commuting cost lead to an "excess wage" which could be linked to differential rent converted to rent by "those who hold space" (Harvey 1982:340).

Ball (1977) explains two major points on differential rent. The first is that the differential rent theories of Ricardo and Marx, which are generally assumed to be same, are in fact different. He distinguishes them on the basis that Marx uses an average approach while Ricardo uses a marginal approach in explaining the expansion of cultivating with additional capital investment, which refers to Marx's differential rent 2. His distinction is also coupled with a different cultivating order. Second is the influence of differential rent on the value of commodities. In classical political economy, differential rent has been assumed to be a price-determined category not a price-determining category, like Smith's monopolistic aspect of 'rent' or Marx's absolute rent. However, Ball argues that not only absolute rent but also differential rent, especially differential rent 2, could affect the value of commodities and the rate of surplus value through successive investment in the same land. His point focuses on the fact that the existence of differential rent reduces the affordability of additional investment of capital in the land, resulting in the acceleration of earlier entry of new peripheral land. As the price of the production on new peripheral land would be higher than the existing average, this would increase market price.

In this sense, indirectly, Ball's argument that differential rent could influence the value of a commodity is correct.

Starting from criticising the Marginalist approach of main-stream urban economics in analysing urban phenomena, Lipietz (1985) argues that Marxian rent theories can be a useful analytical tool. His main criticism of mainstream urban economics is the lack of essential theory to explain the fundamental causes of phenomena in it. Sticking to the principle that rent comes from production in space, he suggests that the product of land is the built environment itself, which creates 'the economic and social division of space'. This reveals his concern with the social relationship around land rent, as well as the economic condition. In applying Marxian rent theory to an urban context, he argues that 1) any distinction between absolute rent and monopoly rent is irrelevant; 2) absolute rent is the rent on the median land in terms of productivity in his formulae (total rent = absolute rent ± differential rent); 3) thus total rent consists of 'land tribute' and 'differential tribute'; and 4) land tribute can be seen from two aspects: 'tribute à la Marx' and 'tribute à la Engels', which mean rent of value created in the construction industry and rent of value created in any branch of industries, respectively. He correctly points out that the concept of absolute rent would not be appropriate if value created in one sector were mixed with values from other sectors without restriction. However, he maintains an ambiguous position on the possibility of this restriction; he removed the distinction between absolute rent and monopoly rent on the assumption of restriction, but at the same time he argues the existence of 'tribute à la Marx' and 'tribute à la Engels'. In addition, he argues that the existence of 'tribute à la Marx' in the construction industry obstructs investment in the industry, and therefore keeps the organic composition of capital in the industry low. Ball (1985) criticised this point saying that the proportion of constant capital, including circulating capital, is relatively high and wage level is comparatively low in the construction industry, so that the organic composition of capital in the industry would not be that low. Ball (1985) also criticises Lipietz's argument about the source of rent as surplus value created in housing sector, by arguing that surplus value created in the housing sector cannot be enough to pay the enormous profits of building industry. Lipietz's argument on the level of absolute rent is also problematic as he set the level to medium. Although the existence of negative differential rent is possible in real housing markets, it is difficult to justify setting the absolute rent to the median of total differential rent. It contradicts not only the most basic starting point of the concept of absolute rent, being a rent which exists even in the worst land, but also the concept of differential rent, being a rent as a surplus. He seems to apply the average level of profit in general industries to the construction industry and extends it to rent theory as the average level of differential rent. A noteworthy point of his work is his comparison of his 'land tribute' to Mayer's (1965) sum of 'anticipation rent' and 'scarcity rent'.

2-3 The premature stagnation

The heated debates and suggestions in 1960-70s have faded since 1980's. Leaving debates unfinished, the interests in the theory has vanished. With different versions of interpretations and unripe application of the theory to an urban context, a seemingly premature stagnation has put the theory back in the closet again. There are many reasons behind the stagnation. Let alone the external factors like the surge of neo-liberalism, there are some internal problems in the ebbing in the development of Marxian land rent theory.

First, the overwhelming degree of interest in the issue of social relations around land and the economic role of rent has made the analysis of the mechanism of land rent relatively neglected. Although the role of built environment as a temporary shelter of accumulation of capital using the concept of the secondary circulation (Harvey, 1982) and the importance of the historical and institutional contexts in land rent theories (Ball, 1985) are undeniable achievement from the argument about the issues, there has been little progress in the analysis of the mechanism of land rent itself. The deficiency of analytical approaches to the mechanism of land rent impeded further development of the theories and made them abstract discussion rather than detailed empirical research.

Second and third reason is closely related with the stagnated analysis of mechanism of land rent. The discussions over the technical condition of absolute rent and its relationship with monopoly rent stuck in limbo with little agreement. While some pointed out the innate problem of the condition of low organic composition of capital for the existence of absolute rent, while others tried to support Marx's original explanation on absolute rent focusing on the economic situation of the early stage of capitalism. Some researchers suggested that absolute rent is the same as 'monopoly rent' and even some went further arguing that absolute rent is not land rent. This will be discussed in Chapter 3 in detail.

Third, there has been inappropriate application of the theory to urban context in identifying the product of the land in an urban context. Ball (1977) suggests 'buildings' as the product from the land saying that "the main effect is that the relationship between the market price of the commodity produced and the rent extracted differs: the commodity produced in agriculture being 'corn' and on urban land, 'buildings'." (Ball, 1977:400). It is a pity that the researcher who contributed to differentiate the Marxian land rent theory against neoclassical urban economics has also made it difficult to develop the theory further with an inappropriate proposition. Focusing on commercial building provision, Ball (1985) asks that rent on buildings should not be confused with rent on land. His concepts of rent from buildings might cause confusion because of his rough juxtaposition of building and land. It is true that rent from buildings is different from that of land. Nevertheless, the space in buildings and the rent from the space are still based on the use of land, as a building is a kind of fixed capital for improving the productivity of land use. It is more appropriate to regard buildings as a fixed capital to improve productivity in land. The inappropriateness of the concept of 'building' as a product of land and 'building rent' in an urban context has also been criticised by other authors in series of papers (Clark, 1986; Haila, 1989; Clark, 1990).

Fourth, as Haila (1990) pointed out, there was a division of the two lines of thoughts which emphasises general laws and concrete situations respectively. In her historical paper on rent theory, Haila (1990) arranges and classifies past arguments on land rent. She classifies the works into two categories. The first one is 'the ideographic group' which emphasises the importance of analysing concrete situations in their historical and institutional context and denies the possibility of a general theory of rent. The second group is 'the nomothetic group', which assumes a tendential uniformity of economic agents in the capitalist mode of production in space and searches for general laws in rent theory. Ball (1977, 1985, 1986) and Harvey (1973, 1974, 1982) are said to be the representative authors in each group respectively. Ball (1986) points out that the decline of Marxian urban studies may be attributed to a tendency to focus on the functionalists approach to the use of land, examining the theories of three influential researchers (Manuel Castells, Jean Lojkine and David Harvey). He argues that the social relations of building provision are substantial not only in rejuvenating Marxian rent theories but also in the proper understanding urban phenomena as a whole. Having pointed out multiple social agents around building provision, including landowners, developers, building firms, building workers, financiers, building owners and final users, he suggests three basic frames which can bridge the building provision and social environment: functional, historical, and political linkage. Harvey (1987) demands that researchers in Marxian camp should deepen and sharpen the theory, criticising the looser 'realist' theorists who have abandoned or withdrawn the fundamental Marxian conception from urban studies. He offers three barriers to be overcome: 1) the influence of Althusserian Marxism, 2) the abstraction of Marxist theory and the specificities in geography leading to the importance of empirical data work on concrete issue, and 3) the tendency to prefer a discourse about 'totalities'. It is important to recognize the general structure of land rents, but at the same time, it should be unfolded through concrete and empirical analysis. The division of the two lines coincide with the timing of the plummeting interest on Marxian land rent theory.

2-4 Neoclassical approaches

Ironically, what filled the empty place of Marxian land rent theories in 1980-90s was neoclassical approaches. There has been a considerable body of neoclassical approaches to Marxian land rent theory. They tried to interpret or solve the problems in Marxian land rent theory in terms of their own economic concepts and terms.

Karl Pribram (1940) unfolds his theory on urban ground rent, starting from the theory of F. von Wieser, allegedly the first economist to focus on ground rent in an urban context. The main point of Wieserian theory is that the main source of urban ground rent is "largely independent of differences in costs of production; it is due to differences in the demand for the services rendered by different real-estate properties and, consequently, to differences in the prices paid for such services" (Pribram 1940:62), which emphasises the role of demand for a group of properties with the same features in the market. The concept of residual rent, which is borrowed from Hoyt (1933), is a more concrete form of the urban ground rent. The rent refers to "any surplus return on the land and building above that necessary to pay operating expenses, taxes, interest, and depreciation on the building is properly assigned to the non-reproducible element in the combination – land" (Hoyt 1933:451). He then focuses more heavily on the concept of absolute ground rent which seems to indicate residual rent over differential rent. Although he does not mention Marx's theory of land rent, his theory of absolute ground rent resembles that of Marx, except for the condition of low organic composition. Another interesting contribution made by Pribram is the relationship between the movement of absolute ground rent and cycles of the building industry in Europe and the USA.

Emmanuel (1985) suggests that it is necessary to apply the concept of monopolistic competition to analyzing land and the housing market, instead of the assumption of perfect competition. Presuming land itself as a product and housing as product of land, he suggests that the products are not homogenous because of their location differences. Based on this difference of products, Emmanuel adopts a condition of a market structure of monopolistic competition. However, the supply of land and housing cannot be controlled without any limit. As the supply of land is naturally limited and the relative importance of the location of each piece of land is determined by social development, land is generally assumed to be in a different category of product from others. Thus the special gain from a particular feature with exclusive landownership has led to a development of rent theory as a unique economic field. However, it is rather more appropriate to separate the feature of location from any product and to instead explain the difference in location by the concept of transport cost. Nevertheless, his adoption of monopolistic competition may have a significant role in explaining absolute rent in an urban context as the concept of 'multiplicity of preference' by 'homogeneous collectivity of consumers' by Chamberlin (1899~1967) can be linked to different housing submarkets by structural features.

Persky and White (1988) review the possibility of existence of absolute rent, referring it to as a rent raised by "a land monopoly or extensive collusion among landowners" (Persky and White, 1988:165). They suggest that the collusion of landowners is likely to arise in so-called 'bad' time when supply curve in the land market lies even further right than the zero marginal revenue point, with the addition of a downward sloping average revenue (demand curve) with a marginal revenue curve and a perfectly inelastic supply curve of land. In order to avoid loss in this situation, they suppose, landowners would collude to control supply in the market. Although it is a unique attempt to explain absolute rent using a supply and demand diagram, there are some irrelevant points. Firstly, as the supply of land is inelastic and the shift of the supply curve is for various reasons difficult to control, its fixity and durability makes it difficult to increase or reduce supply of land in the short run. Furthermore, the situation of "extensive collusion among landowners" is almost impossible where numerous landowners try to maximise their own interest in a contemporary urban context.

The main interest of Bryan (1990) is how to differentiate between the natural and man-made attributes of land focusing on differential rent 2. Admittedly, differentiating the ground rent from a "natural" contribution and the interest from a man-made contribution is not an easy task. Bryan seems to have started with the belief that "land must be understood in the same way as capital generally" and concludes the same demanding that "neoclassical economic theory has divorced the concept of rent from land and attached it to a general conception of monopoly. Marxist theory could well do the same." (Bryan, 1990). However, the difficulty in differentiating between types of ground rent cannot itself be a sufficient condition for annihilating concepts of difference. Excess profit over and above price of production is the fundamental source of any ground rent. If there is no contribution of capital, then all excess profit made from the products of the land can be regarded as ground rent, regardless of whether it was appropriated by landowners or capitalist lessee. If there is some capital investment, the normal profit from it can be regarded as interest. The reason why rent should still be differentiated from interest is that land and amortised or mixed capital with land have different features from general capital. As there can by definition be no two pieces of land with exactly the same location and productivity levels, each piece of land has monopolistic features and there is a somewhat permanent hierarchy which would yield positive differential rent. In addition, fixity, durability, and scarcity make it yield basically permanent absolute rent from different groups of land. Above all, it is because space is an essential condition of any production. The need for this distinction is pointed out by Murray (1978).

Evans (1991) tries to suggest a consistent concept of monopoly rent after reviewing various ways of understanding, and usage of, the concept by many economists. He classifies the different thought processes into three: class monopoly rent, site monopoly rent, and Marxian monopoly rent. He points out that Marshall has transformed the concept of class monopoly rent, which was prevalent in classical economics, into the concept of economic rent by as it refers to the common surplus profit over and above normal profit due to its limited resource. Secondly, he clarifies the misunderstanding of site monopoly as the source of monopoly rent. Although site monopoly rent is based on the unique features of each piece of land and monopolistic ownership of the piece of land, the rent landowners appropriate is not due to their monopolistic control over each site but by is instead due to the passive residual after competition. The meaning of this concept is exactly same as differential rent, which originated from the unevenness among lands. Evans also argues, rather close to the concept of differential rent. Finally, he suggests that Marxian monopoly rent may exist in some contexts, especially in an urban context where planning regulations limit land use. As an example, he uses the case of a unique purpose-built shopping centre. This paper has contributed to clarifying the confusing mixed use of the term 'monopoly' on rent throughout a wide selection of previous literature.

Tracing back through Ball's work in 1977, Evans (1992) agrees with Ball's argument about the difference of the theories of differential rent (including differential rent 2) between Marx and Ricardo. The main divergence between them lies in the way in which capitalist tenants regard cost and return from additional investment in either an average approach or a marginal approach. Subsequently he argues that Marx's theory on differential rent is wrong in practice, as capitalist tenants would "act along the lines suggested by the Ricardian marginalist approach, and not in the way which Marx's use of the averaging procedure supposes" (Evans, 1992:85). However his argument is difficult to accept. The average procedure is more likely to prevail in calculating the price of production and profit. It is because it is hardly possible to distinguish the difference of return from the investment which makes differential rent 2 from the natural difference of land as it would eventually become part of the 'natural' feature of the land after the expiration of the contract between capitalist tenants and landowners. Moreover, in an urban context, capital investment is rarely made in incremental way but generally instead on a large scale, normally in the form of constructing buildings infrastructure.

Houghton (1993) classifies the meaning of monopoly into two sections. The first is 'complete ownership and control' and the second is 'a state of organization (structure) of a market'. With the second definition being one of market structure, he reviews the use of the term of 'monopoly' in related works on land rent. He focuses on the intentionally behavioural feature of agents in the real estate market to create monopolies, rather than stipulating that certain type of space or land can yield monopoly rent. In the process, he suggested two criteria for creating monopoly in urban space. The first is 'non-substitutability' and the second is 'consumer sovereignty'. Essentially, the space should be unique within a 'reasonable' distance from central city and should be backed by sufficient demand. This approach can provide a useful frame for understanding the dynamic movement of capital investment to appropriate higher rents in an urban space.

Evans (1999a, 1999b) argues that the generally accepted interpretation of Marx's concept of absolute rent is incorrect. The controversial issue surrounding the conditions for the existence of absolute rent is the concept of low organic composition of capital, which means that the proportion of capital is lower than the proportion of labour in a sector. Although there have been many debates over the condition suggested by Marx, it has generally been thought that Marx argued that a sector with low organic composition of capital is a potential source of absolute rent. In contrast, Evans argues that the existence of absolute rent makes the organic composition of capital in a sector low, because it reduces further investment of capital. For him, the low organic composition of capital is not a prerequisite condition but instead a result of absolute rent. In a later paper in the same year, he examines the possible base of landowners' claim on absolute rent. The first possible base suggested is transaction cost including 1) the cost of setting up a contractual agreement between landowner and tenant, and 2) the cost of monitoring the activities of the tenant who might harm the property of the landowner. The second possible base suggested is uncertainty, as the landowner can be unwilling to lease sites for a low rent if there is a possibility that a higher rent might be obtainable in the future. However, the base of appropriation of absolute rent which Evans suggested is difficult to accept. It is more appropriate to regard transaction and monitoring costs as part of total cost. Keeping land due to uncertainty in the market is also merely an individual economic judgement of landowners. Uncertainty itself cannot be a sufficient base for absolute rent.

2-5 Recent development in Marxian land rent theory

Since the 'rupture' period of Marxian land rent theory in 1980's, there has been little contribution to the rent mechanism itself. The majority of contribution to Marxian land rent theory focused on Harvey's concept of 'secondary circuit' which emphasised the function of built environment as a temporary shelter for capital accumulation.

Ross King (1987) investigates a long term change of trend in the housing construction industry in Melbourne utilising the vast amount of data of transactions in housing from the 1930s to 1980s. He distinguishes between absolute rent and monopoly rent based on scale difference. He seems to understand absolute rent as 'all rent in a particular region or submarket' by collective power of the landowners, and monopoly rent as excess profit from a monopolistic position by a few landlords a particular piece of land. He argues that investment in the housing sector before 1973 was a 'secondary circuit' of the capital accumulation of Harvey (1982) seeking absolute rent in the housing sector as a whole, while investment after 1973 was another 'secondary circuit' for monopoly rent depending on the 'uneven development of spatially differentiated housing submarkets'. For an explanation of differential house price changes, firstly he suggests that shifts in consumer preference to various conditions, such as accessibility to employment, accessibility to private and selective schools, and the proportion of employed males in professional occupations can be major causes, which can be linked to differential rent from different levels of 'fertility' of labour reproduction. Secondly, he claims that the differential house price changes may come from 1) excess demand as a consequence of class structuration and the changing distribution of income, 2) restricted supply in a particular submarket, 3) augmented or restricted demand from general financial conditions, and 4) the creation of a new submarket or the radical transformation of an existing one, which can create monopoly rent from excess profit in the limited housing resources. Although the theoretical base of his distinction between absolute rent and monopoly rent is not fully discussed in his work, his application of Marxian rents to an urban context is a noteworthy work, especially where he links different conditions of labour reproduction to differential rent and analyses the differentiation process in the housing sector; his applying a theoretical frame to empirical data is the first prominent attempt since the work of Harvey and Chatterjee (1974).

Anne Haila (1989) tries to find an appropriate framework for empirical analysis of land use and investment on land and verifies it using empirical data from Helsinki. She classifies four types of theories of investment in land and property: 1) the theory of derived demand by effective demand for profit using land, 2) the theory of switched investment focusing on Harvey's 'secondary circuit' to use the built environment to alleviate the crisis in the 'primary circuit', 3) the theory of conditions for restructuring, regarding the built environment as a basic condition for the reproduction of labour and means of production, 4) the theory of the real estate sector's intrinsic dynamic, emphasising the internal mechanism inside the sector distinguishing itself from Harvey's 'secondary circuit'. Subsequently, she classifies investment on land and property into four types by purpose and timing: 1) investment for present actual demand, 2) investment for present lettings, 3) investment for future actual demand, and 4) investment for future sales.

Using empirical data collected from cities in West Germany, S. Krätke (1991) argues that traditional land rent theory on capital accumulation needs to be reformulated. Traditionally the appropriation of land rent has been regarded to have a negative influence on capital accumulation, as it removes values created in production spheres. Noticing the trend that capital is actively involved in property development in urban space, and focusing on the phenomena of the fusion of capital and landed property, he suggests that land rent needs to be regarded not as a barrier to capital accumulation but as an alternative source. There is some research highlighting the merger between the two classes and increasing the tendency of capital inflow to the built environment (Massey and Catalano 1978, Harvey 1982). This opinion can be also found in Scott's argument (1980). He suggests a new perspective on the role of rent as an assistant, not a barrier, to capitalist accumulation. He considers that rent has a positive function in capital accumulation, because "land rent enters immediately into the stream of new investments generally, where it contributes directly to the accumulation process" (Scott 1980:30). However, this trend of merger does not necessarily mean reversing the tendential fall of rate of profit in capital accumulation. This issue can be examined in two aspects: easing over-accumulation and creating new surplus value. Their argument would only be feasible in the context either that the diversion of capital investment to built environment prevents over-accumulation and overproduction in production spheres, or that capital invested in built environment creates a considerable source of value in the construction process. If the advance of capital in land as merged landownership takes the form of purchasing or mortgaging existing property to appropriate current land rents, thus attracting financial investment, the existence of land rent would not only remain a barrier to capital accumulation, but also become an abyss over which capital accumulation as a whole would be, behind a temporal easing effect to individual capital. As appropriating land rent in the form of profit cannot change its role as a distributional form of surplus value, the inflow of capital into land in that way (transfer of ownership) would have a negative impact on capital accumulation in term of creating surplus value. In addition, as opposed to Scott's argument, it is more probable that rent would circularly flow back into land as an investment in a fictitious commodity, rather than in the production sphere. Moreover, financial investment fever around the built environment as a fictitious commodity would eventually raise the cost of using housing and offices in the area, leading to a decrease in purchasing power, which is another big threat to capital accumulation in the long run. Harvey (1982, 1989) has been the most effective so far in explaining these phenomena. Pointing out, firstly, the positive aspect of rent in capital accumulation - the over accumulation problem can be alleviated by diverting capital into land on the so-called secondary circuit - he concludes that this would not be an ultimate solution but would rather aggravate the problem due to an overinvestment in this fictitious commodity.

There has been an interesting discussion of the impact of nationalisation on land rents. As a politician in India, Namboodiripad (1984) has worked on land rent theory, focusing on practical policies suggested in India. From the point of view of agrarian communism, Marx's land rent theory is reviewed in a hypothetical situation of the nationalisation of land. The use of quotations by Kautsky and Lenin on differential rent and absolute rent is very interesting. Their main points are 1) the two types of rent are the most important types of rent, 2) in reality, as the two rents are mixed together even with the interest of capital invested, the division of categories of rent is difficult but extremely important, and 3) the nationalisation of lands would abolish absolute rent but not differential rent, as the difference of location and fertility of lands remains even after nationalisation. The argument on the abolition of absolute rent is valid only if there is single use of land. However in an urban context, as spaces are fragmented by different combinations of capital, there is likely to be different levels of absolute rents within a similar group of spaces. As differential rent cannot be abolished after nationalisation, due to different location and figures, absolute rent by a group of space would remain, except for in the worst group of spaces.

Utsa Patnaik (1999) reviews the Marxian land rent theory comparing it to those of Adam Smith and David Ricardo in the form of a response to the paper by Namboodiripad (1984). Her claim on the origin of Marxian terms of differential rent and absolute rent is a unique contribution. She argues that the 'rent' of Smith is a rent "which arose because private property not only existed, but was monopolised in a few hands." (Patnaik 1999:52) and Marx denoted this 'rent' of Smith as absolute rent. She also argues that 'rent' to Ricardo means 'the extra profit over and above the average profit' and that Marx denoted this as differential rent to differentiate it from absolute rent. On the issue of nationalisation and the following impact on the ground, which was raised by Namboodiripad (1984), she takes the same position, that absolute rent would disappear whereas differential rent would remain.

Economakis (2003) reignites the discussion on the condition of absolute rent. As one of the rare attempts to examine the rent from value theory, he correctly interprets the condition of absolute rent suggested by Marx and highlights the real problem in the condition. Considering the fact that sectors with high organic composition have a higher rate of surplus value, he demonstrates the possibility that the value of a product in a higher organic composition of capital can have a greater value than that in low organic composition of capital with concrete figures of values. He argues that the concept of absolute rent should be accepted only when it has monopoly price, which means that absolute rent can exist when the market price exceeds the price of production. Comparing this to differential rent, he refers to "political rent". His emphasis of the class relationship between landowners and capitalist tenants over the appropriation of ground rent is very similar to the concept of "class monopoly rent" by Harvey (1974).

The institutionalist approach of Jäger (2003) is a unique contribution to the theory. He revaluates existing urban land rent theories and suggests that it could be useful to analyze urban rent from the perspective of the French Regulation School. Jäger properly emphasises the influence of 'institutional regulations' on differential rent 2. He points out that "institutional regulations limiting the type of use of urban land, like zoning or building restrictions, are of decisive importance in preventing or enabling the formation of intensive rent" (Jäger 2003:245). He also suggests that "gentrification may be interpreted as resulting from the real estate developers' search for a cheap urban space in order to capture DR2" (Jäger 2003:245). Regulations on urban land use and building, such as zoning, total floor area, and height limits, would set the structural feature of property. As absolute rent and differential rent differ between each group of housing with similar structural features, changes in this regulation would lead to changes in the potential level of rent. Successive capital investment can then valorise this increased potential. However, it might not be appropriate to presume all these potential or actual changes in the level of rent to be differential rent 2. Increased rent by capital investment for the highest return the site can get could be notionally regarded as differential rent 2, but the true nature of it is the gap between the combination of absolute rent and differential rent in the group of housing it entered and the combination of them in the existing group. Otherwise, in the case that it creates a unique and popular type of property, the true nature of increased rent would be monopoly rent. This will be discussed in chapter 3.

2-6 Conclusion

The development of Marxian land rent theory has been stagnated by some crucial problems which were revealed during the period of heated debates, let alone the lack of empirical analysis. Based on these, I suggest four main needs for the further development of the theory.

First, the research for a consistent theory of the mechanism of land rents is needed. The issue of how land rents emerge was overshadowed by the massive interest in class relations around space, which is easy to remain abstract. However, detailed analytical approach with the categories of land rents can provide useful tool for empirical research to explain various urban phenomena. The discussion over class relationship around space can be fortified with the advances in the theory of land rent mechanism.

Second, the product of the land needs to be identified for an urban context. The proposition of 'buildings' as the product of the land in an urban context has brought confusion in the field. Land rent is based on the relationship between landowners and users over the production process in the land. In this context, what is the product of the land in different types of spaces is a crucial question in the development of the theory.

Third, the debates on the condition of absolute rent and the relationship between absolute rent and monopoly rent needs to be re-examined. The urban spaces of fragmented uses and features make absolute rent and monopoly rent important. Without sorting out the problems, related research would remain as the discussion at an abstract level.

Lastly, a consistent theory of the structure of land rent in an urban context needs to be established. The original theory based on agricultural production conditions needs to be reorganised to be suitable for an urban context. Of course, this requires proper handling of the previous two needs.

It is undeniable that Marxian land rent theory at this stage is not perfect for analysing the structure of house prices. However, it has the potential to be a convincing alternative to mainstream economics as it focuses on the fundamental basis of the changes in house prices. For further advance of the theory, the four needs should be properly addressed.

Chapter 3.

A renovation of Marxian land rent theory in an urban context

3-1 The product of the land

3-1-1 The relationship between land and production

The monopoly of landed property and the inseparable relationship between production and land are two fundamental sources of land rent. Exclusive ownership of scarce resources of land is a basic condition of claiming land rent. However, legal ownership of land alone does not provide the sufficient conditions for the appropriation of land rent. Another basic condition for the collection land rent is the economic condition that capitalists[3] have to employ land as an essential factor or instrument of production. Marx pointed out that legal power alone cannot generate land rent but instead, the appropriation of land rent is only possible when particular economic conditions support it.

"Landed property presupposes that certain persons enjoy the monopoly of disposing of particular portions of the globe as exclusive sectors of their private will to the exclusion of all others. Once this is given, it is a question of developing the economic value of this monopoly, i.e. valorizing it, on the basis of capitalist production. Nothing is settled with the legal power of these persons to use and misuse certain portions of the globes. The use of this power depends entirely on economic conditions, which are independent of their wills." (Marx 1991:752)

Marx then summed up this feature of ground rent as follows.

"Ground rent is thus the form in which landed property is economically realized, valorized." (Marx 1991:756)

Given this feature of ground rent, the following questions naturally arise. Which economic conditions enable a landowner to demand ground rent? How is the level of ground rent

[3] Capitalists can become landowners by buying land and in the same manner landowners can also be capitalists if they use their own land for production. Ordinary workers also lease land for various purposes including reproduction of their labour power. Although the actual relationships across land may vary, in the following discussion the separation between a lessor and lessee of land will be maintained to make the renting relationship straightforward.

determined? These are central issues in the theory of rent mechanism, which will be reviewed throughout this chapter. In order to approach these questions properly, it is essential to examine the relations of production in land where the economic conditions between the capitalist and the landowner are reflected in determination of the level of ground rent. Despite the importance of the production phase in the chain of 'land ownership – production – ground rent', this has not been properly examined in related research. It is crucial to have a clear idea of the economic relations of production not only to understand the complicated concepts of ground rents but also to apply these concepts to an urban context.

Although detailed mechanisms vary across the different categories of ground rents, the basic source of ground rent is the excess profit[4] made by capitalists in the production utilising a particular piece of land. The landowners would claim that a part of the excess profit is due to the superiority of their land and that part of excess profit would thus be converted to ground rent.[5] However, landowners cannot arbitrarily claim an unreasonable level of ground rent as capitalists can move their demand elsewhere. At the same time, capitalists' choice in selecting land as a factor of production is also limited. The level of excess profit contributed by using a particular piece of land is dependent upon various factors like land use, location, and productivity of land. The economic decisions of landowners and capitalists are likely to be based on these considerations. These economic decisions would form the basis of an underlying mechanism of ground rent centred by fluctuating market rent levels, which is the main focus of this chapter.

In any analysis on economic relations of production in land, the question of what is the product of the land should first be properly identified. The 'product of the land' means the product which the capitalist produces using land. Market price and production cost[6] of the product of the land are major factors in determining the amount of profit for capitalists, who have to decide which land they lease and how much they have to pay as rent. Therefore one of the major concerns of capitalists leasing land is choosing which product they will produce. Most

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[4] Excess profit means the amount of total revenue left after taking away the cost of production and normal profit. As normal profit means an average level of profit in industries, the profit exceeding this average level is also called abnormal profit or supernormal profit.

[5] Hereafter the excess profit due to the contribution of the land will be assumed as ground rent regardless of whether it is taken by landowners as rent or by capitalist tenants / capitalist landowners as excess profit. Although actual payments of ground rent vary between people, time, or market conditions, excess profit or ground rent hereafter means Smith's 'natural rent' which actual payments fluctuate around. This relationship between natural rent and real rent is similar to the relationship between price of production (see footnote 8) and market price.

[6] Marx uses the term 'production cost' and 'cost price' for the same meaning of total cost of production.

of the rent theories from classical political economy used corn as the product of the land in developing their theories, because agriculture was the main industry and corn was the main product of the land in that time. In identifying the product of the land, it would be useful to clarify the main features of the product of the land in classical rent theories. Based on classical rent theories, the product of the land has two main features. The first is that the product of the land is the final product from various possible production processes using each piece of land. The price of the product of the land also plays a major role in determination of the level of ground rent. Firstly, corn is a final product from a production in land. Secondly, its price mainly determines the level of ground rent in the following ways:

1. differences in productivity in terms of fertility or location would generate excess profit creating differences between production cost and market price of corn; 2. an additional capital investment for fertility or accessibility improvement on land could lead to an increase in excess profit over and above the production cost, through increased productivity; 3. particular situations of excess demand in the corn market could make a further common experience of excess profit in the sector due to increased market price of corn; 4. if corn from a particular piece of land has a monopoly price because of a special quality, excess profit could be generated. Part of these excess profits from the gap between market price and production cost would be appropriated by the landowner as ground rent. However, in an urban context, this question of what is the product of the land has not yet been properly answered.

3-1-2 The product of the land in an urban context

As opposed to in agriculture, in the urban context there are some different arguments about what constitutes the product of the land. Ball (1977, 1985), who was influential in the developments in Marxian rent theory, argued that a building itself could be understood as the product of the land in an urban context. He suggested that it is relevant to see building provision as a production process in an urban context.

"The main effect is that the relationship between the market price of the commodity produced and the rent extracted differs: the commodity produced in agriculture being 'corn' and on urban land, 'buildings'." (Ball 1977:400)

This, however, is one of the most serious misunderstandings in the related research. According to the two main features derived from classical rent theories, buildings are irrelevant to be the counterpart of corn in an urban context.

Firstly, a building is not a final product from the production process. Buildings are not final product from land, but fixed capital to improve land rents. Clark (1987b) argued that buildings are fixed capital pointing out the inappropriateness of buildings as the product of the land.

"My criticism is that in their distinction they compare the *products* of agriculture with urban *fixed capital*, … one may just as well reverse the order by comparing urban products with agricultural fixed capital." (Clark 1987b:1123)

The same point is also found it Marx's own writing."Capital may be fixed in the earth, incorporated into it, both in a transient way, as is the case with improvements of a chemical kind, application of fertiliser, etc., and more permanently, as with drainage ditches, the provision of irrigation, levelling of land, farm buildings, etc." (Marx 1991:756)

Developers and investors in building properties may regard a building is a final product which can be sold and bought. Considering that sales of properties are entirely normal in contemporary society, this view seems to be acceptable. However, the reason why buildings are commercially traded is that the property rights on buildings are based on the rights on the rents from the potential lease of spaces in buildings. Marx made a clear point on this.

"…, it is ground rent and not the houses themselves that forms the real basic object of speculative building; … the builder makes very little profit out of the buildings themselves; he makes the principal part of the profit out of the improved ground rents." (Marx 1991:909)

Physically, buildings appear to be yields from the soil, rooted on the ground like corn or other agricultural crops. To regard the product of the land as product of the soil can create this kind of misconception. To avoid this, the product of the land should be understood not as the product of soil but as the product of *space*. The essence of the use of land and the following land rent appropriation is the lease of space. Building as a fixed capital is essential to create spaces from land but it is not appropriate to see it as the fundamental source of land rent.[7] Land rent, then, should be understood as *space rent*.

Secondly, it is not appropriate to regard the price of building as determining the level of land rents. The price of building mainly consists of the production cost of constructing building, normal profit, and capitalised land rents in the future. However, it is more appropriate to see that level of land rent determines the price of building. The price of a building depends on what

[7] In this sense, regulation on the total floor area of a building can determine the total area of space based on a piece of land and the total sum of land rents in the building. It thus functions as a crucial determinant of land rents and price of a piece of land.

production activities are conducted in and how much rent could be yielded from the spaces in the building. Haila (1989) went further than Clark with commenting that the product of the land in the urban context is commodities and services.

"The correct counterpart in the urban case is commodities and services, not buildings." (Haila 1989:1527)

This is a correct point as commodities in industrial land and services in commercial land are the final product in each production process and the level of prices of them determines the level of land rent in each use of land. Yet Haila's suggestion does not cover residential space, although the most dominant use of urban land is residential use. As housing is the essential base of any kind of reproduction of labour power, labour power can be seen as the appropriate counterpart of the product of the land in residential space. In housing, ordinary workers manage the reproduction process for their daily labour power, including that of their family in the long run. Thus, the demand for housing reflects this desire of people to reproduce their labour power in a decent space. The source of appropriation of land rent in residential land then can be seen as a reproduction process of labour power. Labour power is a final product of the residential land and it influences the determination of land rent in residential land.

3-2 Land rent in general context

3-2-1 Differential rent

Classical rent theories had mainly focused on the agricultural sector which was the major industry at that time. In cultivating crops, the fertility of soil is one of the main determinants which influence productivity and profit. The formation of the market price of crop and the production cost or price of production[8] in each agricultural production using land was the main focus in the theories. Classical economists expressed little difference in the concept of differential rent (DR)[9]. They thought that the different conditions of production by land were the fundamental source of DR. Farmers have different production costs due to various factors

[8] Marx use the term of 'price of production' (production price) of individual capitalist meaning the sum of cost of production and normal (average) profit.

[9] In fact, classical political economists rarely classify land rent into separate categories. For example, Adam Smith's 'rent' means all categories of land rents as he explains 'rent' arises out of monopoly, differential advantage in production, and scarcity, which lead to considerable confusion (Gee 1981). In the same manner, David Ricardo, a major contributor to the theory of differential rent, refers it as 'rent', along with James Anderson and Robert Malthus. Marx invented the name later (Patinaik 1999).

of production although they produce homogenous products like corn. The market price of the agricultural product is likely to be determined by the level of the price of production from producers in the worst condition[10] as they have the highest production costs. If the market price is determined below the level of production price according to change in supply and demand, the producers in the worst condition would have to leave the sector as they would face loss. In contrast, if the market price is determined over and above the production price level, other capital would flow into the sector leading to expansion of cultivation because of the opportunity to enjoy a higher profit level in this sector. Once the market price was determined, other producers who had a lower production cost than the farmer in the worst land would have excess profit, comprising the difference between the market price and their production cost.[11] The landowner leasing lands would then demand a part of the excess profit claiming that this difference in production cost originates from the superior fertility or location of their lands. Therefore the excess profit due to different conditions of production in land could be appropriated by landowners. Otherwise landowners would try to replace the lessee to secure their right to the excess profit. Through the struggle between landowners and capitalists with changes of lease contracts for appropriating a portion of the excess profit, an underlying basis of ground rent would be formed. This appropriated excess profit, created by different conditions in land, is regarded as DR.

If demand for a product of the land in a sector increases for some reason, that would temporarily increase the market price. Capital from other sectors would then flow into the sector seeking a higher rate of profit from excess demand. Capitalist tenants would then have to lease lands for production and choose less fertile lands or lands further from the market, because superior lands are likely to have been already leased by existing producers. Because they would have to use inferior lands in production, the production cost would be higher than that of existing producers and some of them would therefore be operating under the worst production conditions in the market. If the demand remains the same, cultivation in agriculture would expand further and the market price would go up due to increased production costs for the

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[10] The worst condition of production in agriculture normally means the worst fertility but it can also mean the poorest accessibility to central market in terms of location difference.

[11] This is consistent with the concept of producer surplus in welfare economics. Compared to the nominal concept of consumer surplus consisting of potential benefit, this would be real excess profit to producers. If the excess profit due to having lower production cost is from other factors such as innovation in technology or production process, it would be likely to remain as excess profit to capitalist. However if some part of it is attributed by superiority of land, the part of it would be transferred to landowners as ground rent.

worst cultivation. This expansion of production on inferior land would therefore widen the gap between the market price and price of production of existing producers using superior lands, which is likely to lead to an increase of the volume of DR in the market. This increase of DR from the expansion in cultivation of inferior lands is referred to extensive DR of differential rent 1.

At the same time, when there is an increase in demand for the product, the producer could choose options other than leasing inferior land. As productivity can be improved with investments on existing land (such as fixed capital investment including irrigation, fertilization, and drainage), the production costs of producers can vary as the result of it. The worst land before capital investment will not necessarily have the highest production costs in the market as there could be vast improvements in productivity by investment. The producers who invest successive capital or employ more labour on their existing land can appropriate excess profit depending on the improvement in productivity. However, landowners can also take away this excess profit from the lessees when the lease contract has expired, because most capital poured into land is likely to be sunk costs. This excess profit is referred to differential rent 2.

Although there are some arguments on the methods in development of rent theory especially on intensive DR between the Ricardian and Marxian approach (Ball 1977, Evans 1992, Ball 1992), it is generally accepted that there is little difference in the main idea. However, as the Marxian explanation includes various cases of the consequences of additional investment and employs mainly fixed capital investment cases which are helpful in understanding the fundamental feature of intensive DR, the Marxian approach of DR will be dealt with here.

Marx denotes the increased ground rent by additional capital investment as differential rent 2 (DR2). This originates from the widened profit margins by successive investments on the same land. As DR is based on the unevenness of productivity of different lands and the comparison between them, DR2 is also based on the mechanism of comparison between the worst land and superior land in terms of productivity. Before the expiration of the contract on a land, the capitalist tenants can enjoy the excess profit from successive investment on the land as excess profit. However, once the contract on the use of the land expired, landowners would try to take the improvement as rent by renegotiating terms of contract of tenancy, which leads to an eventual transformation of the profit to rent. After all, several changes in tenancy would make it hard to discover whether the difference of productivity comes from existing productivity of the land or additional investments on it. This feature of DR2 is clearly stated by Marx.

"Although these are the product of capital, they operate just like the natural differential quality of the soil" (Marx 1991:844)

"In the case of differential rent II, they (differential results) must first be made distinguishable, they must in fact be transformed back into differential rent I, and this can only be done in the manner indicated" (Marx 1991:861)

This surplus increased by additional investment within the same lands would be regarded as excess profit for the capitalists before the expiration of the contract. However, after the expiration of the lease contract, it would be regarded as improved ground rent of DR2 to landowners. However, it eventually transforms into DR1 as division between DR1 and DR2 becomes ambiguous. Therefore DR2 can be seen as a temporary category of ground rent in Marxian rent theory[12] and DR1 (abbreviated as DR) comes to assimilate successive rounds of investment in ways which make it seem indistinguishable from the 'natural' qualities of the place.

The changes in DR and DR2 depend on the way in which capitalists invest. Capitalists always search for a more profitable form of investment. In general, capitalists can either intensify existing production or extend production. In terms of land use, capitalist tenants can either invest more on existing land or expand their production by leasing other lands. Considering the general demands of the market, price of production, and the productivity change from additional investment on the same land, capitalists would take the investment offering the best return. If the demand within the market increases, many capitalists would find it more profitable to simply extend their production to outer lands, which are generally worse lands. This inflow of worse lands would increase the highest production cost in the industry. DR in the sector as a whole would then increase following the increase in market price. On the other hand, if an investment is thought to significantly change the productivity of a land when the demand of the market remains at a similar level, capitalists would find the investment on existing production more profitable. The excess profit from successive investment on the same land can be regarded as DR2. However, this would only change the level of ground rent in the specific piece of land, as the influence of successive investment is confined to the related lands only. In this way, there are dynamics of capital movement between additional investment on the same land and expansion to new land, which would determine the level of DR and DR2.

[12] This is also pointed out by Fine (1979).

3-2-2 Absolute rent

Differential rent (DR) and absolute rent (AR) are the key components in Marx's land rent theory. This fact can be found not only in his outline on rent analysis[13] but also in his direct remark that DR and AR are the only *normal* rents[14]. Marx adopted DR theory from classical political economists like David Ricardo, and developed it further with the concept of differential rent 2 in various situations[15]. However, it is generally accepted that AR theory has been developed by his unique contribution.

"The only thing I have got to prove *theoretically* is the *possibility* of absolute rent, without violating the law of value. … Ricardo denies this possibility. I maintain that it exists." [requoted from Limits to Capital (Harvey 1982:349), Selected Correspondence (with Engels), p.134]

Through this remark in his early days it is not difficult to deduce the importance of this theory to him. However, the importance and the implication of AR to recent researchers varies a lot. This variation is mainly attributed to the technical condition of low organic composition of capital (OCC) in a sector suggested by Marx.

Emmanuel (1972) and Economakis (2003) pointed out the innate problem of the technical condition. Referring to the incompleteness of Marx's text on the question, Emmanuel suggested that AR can exist without the condition but it is different from 'monopoly rent' or 'scarcity rent'. Fine (1979) and Murray (1977, 1978) explained the condition further focusing on the economic situation when the original text was written. But they might overlook the possibility of the innate problem of Marx theory on this to be applied to different economic contexts. Harvey (1973, 1982) acknowledged the condition of AR in particular occasions like the early stage of capitalism in agriculture but recognised it less important in the contemporary capitalist mode of production. While some regard AR as same as 'monopoly rent' or 'scarcity rent' in an urban context discarding the technical condition (Pribram 1940, Harvey and Chatterjee 1974, Scott 1976, Lipietz 1985, Persky and White 1988), some suggested new labels for the rent. Harvey (1974) suggested 'class monopoly rent' and Economakis (2003) suggested 'political rent'. Even some argue that AR is not land rent. Jäger (2003) argued that it is not a rent in a strict sense, regarding it as a reservation price. Evans (1999b) suggested that it is relevant to regard it as the mixture of

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[13] Marx 1991:860; the heads of proposed rent analysis are A. differential rent B. absolute rent C. The price of land D. Final consideration on ground rent

[14] Marx 1991:898

[15] Explanation about DR 2 takes five chapters out of eight on the whole analysis on ground rent (rest two chapters for DR and one chapter for AR)

transaction cost, monitoring costs, and risk-taking compensation.

In the following, AR theory of Marx will be critically re-examined. A new approach will be attempted for the interpretation of AR. In the process, Marx's confusing conceptualisation over the condition of AR will be tackled.

Marx developed AR theory which could be compatible with DR theory finding that land rent was actually demanded even in the worst land. If a landowner in the worst land with no DR can demand some amount of land rent for the lease, other landowners operating under superior conditions in the same sector would also demand a similar amount of land rent as the worst land in addition to their existing DRs which result from the difference in productivity. Once the amount of additionally demanded land rent is established generally as that in the worst land, the land rent (AR) would be a basic toll to be raised from every piece of land in the sector. Marx wondered what conditions made this universal and cost-increasing land rent (AR) possible.

Comparing the rent with tax imposed by the state power (Marx 1991:892), he suggested two conditions for the existence of AR. The first condition was that the organic composition of capital (OCC) in a sector must be lower than the social average. In the sector of lower OCC, more surplus value is generated. He thought that it was the positive gap between the value and the price of production that allowed the landowners to demand AR.

"In any case, it still holds theoretically that it is only on this premise that the value of agricultural products can rise above their price of production; i.e. that the surplus-value produced in agriculture by a capital of a given size, or, what comes to the same thing, by the surplus labour that it sets in motion and commands (i.e. the total living labour applied), is greater than for an equally large capital of the average social composition.

This assumption is therefore sufficient as far as the form of rent we are examining here is concerned, and it is a necessary assumption for this rent to arise. Where this hypothesis is inapplicable, the form of rent corresponding to it disappears." (Marx 1991:894)

"If the average composition of agricultural capital were the same as that of the average social capital, or even higher than this, the result would be the disappearance of absolute rent in the sense developed above, namely a rent that is different both from differential rent and from rent depending on an actual monopoly price." (Marx 1991:899)

About this condition, Evans (1999a) argued that Marx stated the low OCC is not a necessary condition but the consequence of AR. From the quotations above it can be recognised that Marx clearly said that the low OCC is a necessary condition for AR. Nevertheless, it is a critical argument from Evans that the AR demanded by the landlord would make the OCC low in agricultural sector. If there were a barrier against capitalist investment due to an existence of AR in a sector, the OCC in the sector would be lower than those in others.[16]

After making the argument about low OCC, Marx went on to suggest that the low OCC condition alone was not sufficient for the existence of AR, because not all sectors with low OCC yield AR. He added one more condition.

"This simple fact, however, of a surplus in the value of agricultural products over and above their price of production would in no way be sufficient in itself to explain the existence of a ground rent…" (Marx 1991:894)

"… landed property is the barrier that does not permit any new capital investment on formerly uncultivated or unleased land without levying a toll, i.e. demanding a rent" (Marx 1991:896)

The other necessary condition for appropriation of AR is the power of landed property. Marx thought that both low OCC and landed property were essential conditions for the existence of AR. That is to say, AR arises when low OCC in the agriculture sector makes room (positive gap between value and price of production) for it, and landowners consciously demand it with the monopolistic power on their lands. On these conditions for appropriation of AR, however, two main points should be examined further: 1. whether the condition on OCC is relevant and 2. where the power of landed property comes from.

1. Relevance of the condition of low organic composition of capital

The low OCC statement implies that AR is allowed only when the value is greater than the price of production. According to Marx's own writing and the interpretations of other authors on this (Emmanuel 1972, Harvey 1974, Scott 1976, Murray 1977, Fine 1979, Lipietz 1985, Economakis 2003), the amount of AR cannot exceed the gap between the value and price of production of the product in the sector, so market price of a product including AR cannot exceed its value.

"…, this rent forms the excess of the value above the price of production, or a part of this excess." (Marx 1991:896)

"… as a result of the barrier that landed property sets up, the market price must rise to a point at which the land can pay a surplus over the price of production, i.e. a rent.' (Marx 1991:896)

"[where AR applies]… agricultural products are always sold at a monopoly price, not because

[16] See appendix 3-1

their price stands above their value but rather because it is equal to their value, or is below their value but above their price of production." (Marx 1991:897)

"…, it is clear that in these sectors of production a surplus profit will arise, from the excess of commodity value above its price of production, this being transformed into rent and as such becoming autonomous vis-à-vis profit." (Marx 1991:896)

These statements are based on the assumption that AR in a sector originates from the surplus value generated in the sector. Marx thought that the sector with low OCC could yield excess value over its price of production[17] and a part of the excess surplus value could transform into AR. He seems to have assumed that the appropriation of the excess as AR in a sector can prevent the surplus value from flowing into the general equalisation process of the general rate of profit. His thought can be understood as the production and distribution of surplus value in the AR-bearing sector and other sectors operate separately and therefore the surplus values from different sectors are hardly mixed together.

This particular situation where landed property can play a decisive role in limiting the movements of surplus value and capital may be possible in *the early stage of capitalism* especially in agriculture (Harvey 1973, Fine 1979). Focusing on the relationship between DR2 and AR, Fine (1979) provided an explanation of why the amount of AR cannot exceed the difference between the value and the price of production of the product in the agricultural sector in the early stage of capitalism where capitalists' investment is limited within the sector. This explanation by Fine might be a good answer to the question raised by Marx himself, "if landed property gives the power to sell the product *above* its cost-price at its *value*, why does it not equally well give the power to sell the product *above* its value, at an arbitrary monopoly price?"[18].

This condition is, however, inappropriate in *the contemporary capitalism*. With ever greater mobility of capital, the surplus value in the low OCC sector can actually get mixed with surplus value from all other sectors of different OCCs. Once goods and services produced in a land are traded in markets, the issue of where a particular quantum of surplus value comes from becomes meaningless in the process of equalisation of the general rate of profit where capitalists take an

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[17] As 1) price of production is sum of cost of production (constant capital + variable capital) and average profit and 2) value of product is sum of cost of production and surplus value, excess value means excess surplus value over average profit.

[18] Marx 1968:332, Emmanuel 1972:219, Harvey 1973:182; Emmanuel pointed out the incompleteness of Marx's theory in this question quoting this as it is a posthumous work edited by Engels; In addition to this, Marx left a seemingly opposite explanation on the monopoly price saying AR can make the market price greater than value. "Conversely, the rent would create the monopoly price if corn were sold not only above its price of production but also above its value, as a result of the barrier that landed property opposes against the rent-free investment of capital on untilled land." (Marx 1991:910)

aliquot from the whole mixture of surplus value according to their size of capital input. Furthermore capitalists would regard AR appropriation in a sector as an extra cost, so they can withdraw their capital from the sector if the rate of profit was lower than the social average after paying the cost or they would remain in the sector if the rate of profit was higher than the social average even after paying the cost. Under the contemporary capitalism, it is hardly meaningful to assume that surplus value produced in a certain sector can be blocked by any barriers. Thus low OCC in a particular sector is inappropriate to be a necessary condition of the existence of AR in the contemporary capitalism. Economakis (2003) also denies the low OCC condition for AR on the basis of the fact that value of product in high OCC can have greater value than that in low OCC if it has higher rate of surplus value (rate of exploitation). He suggests to replace absolute rent without the OCC condition with 'political rent' which reflects the class conflict between bourgeois and landowners.

If the determination of the level of AR is not limited by the value over price of production, there would be no restriction on the amount of AR. Market price including AR could therefore be over and above, below or coincidently equal to the value of the product. Actually there are many sectors which have a considerable level of common rent in each sector that function like a toll for production in the sectors regardless of their OCC. The condition of low OCC seems to be valid only in the particular condition of agricultural sector in the early stage of capitalism. However, it may confine the development of land rent theories to apply the technical condition to other contexts in a different stage of capitalism.

Facing this complicated problem, some researchers tried to apply this condition to an urban context without proper examination[19] while some abandoned the entire concept of AR because they thought it reinvigorated the old dispute over the labour theory of value.

This study suggests to keep the name of AR for the common rent in a sector without the technical condition of low OCC for some reasons. First of all, in spite of the confusing condition of low OCC, the institutionalised common rents do exist in many sectors, especially in the urban context, where fragmented groups of spaces increase the possibility of landed property to appropriate the rents.

Secondly, it is inappropriate to take the common rent in a sector as monopoly rent. This

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[19] Lipietz (1985) and Edel (1975) argue that building industry can have AR in the urban context for the reason that the industry has low organic composition of capital like agricultural sector. They confine the source of AR in urban context to surplus value created in construction sector. This point has been appropriately criticised by Ball (1985).

common rent in a sector is a structurally institutionalised cost to users of space in the whole sector rather than that from a monopoly price. The relationship between this rent and monopoly rent will be discussed in the next section. Thirdly, new labels for this rent may overlook the original feature of the rent. For example, 'class monopoly rent' or 'political rent', may overlook the economic aspect of the rent, while it is also difficult to regard this rent as 'scarcity rent' which does not involve production relationship in the space and the tension between landed property and tenants. For these reasons, this study regards this rent as AR without the condition of low OCC focusing on the basic feature of the institutionalised common rent in a sector.[20] If the technical condition is discarded, the concept of AR can be a very useful frame to understand the structure of urban land rents without confusion over the value of the product of the land.

2. The source of power of landed property

The discussion on the source of landed power appropriating AR could be followed by these questions. Firstly, why do capitalists invest their capital into the AR-bearing sector when AR, an apparent barrier, would increase their production cost? Other things being equal, capitalists would be reluctant to invest in a sector of higher cost. Secondly, what makes landowners have the power to claim AR? The answer to this could be either that they have a strong coalition or there is a particular condition to make it possible. These two questions are inseparably related to each other.

On this condition of AR, Marx has provided an important clue.

"Legal ownership of land, by itself, does not give the proprietor any ground rent. It certainly does give him the power, however, to withdraw his land from cultivation until economic conditions permit a valorization of it that yields him a surplus, … He can neither increase nor reduce the absolute quantity of this field of occupation, but he can affect the quantity of it on the market." (Marx 1991:891)

According to this, landowners should wait until certain economic condition allows capitalist tenants to afford land rent in a sector. The particular economic condition arises where excess demand exists in the sector resulting in a higher market price and excess profit. This enables capitalist tenants to afford to pay land rent regardless of which land they use in the sector. The landowners can appropriate a part of the excess profit as AR. Although Marx emphasised the

[20] Emmanuel (1972) pointed out the existence of this rent as AR without the technical condition. "Absolute rent can very well exist, however, without this yardstick and without the limit." (Emmanuel 1972:220)

ability of landowners to control the supply of land on this condition, the coalesced strategic behaviour of landowners to control land supply is not a sufficient condition for AR in the contemporary capitalism[21]. It is instead due to combined factor of increasing and inelastic demand for land as an essential factor of production and limited or inelastic supply of land in a sector. The importance of demand-supply in the formation of AR can be found in the following arguments of Marx.

"Whether the rent is equal to the whole difference between the value and the price of production, or only to a greater or lesser part of this difference, depends entirely on the state of supply in relation to demand and on the scale of the area newly brought under cultivation." (Marx 1991:896)

"… absolute rent can only be small in normal conditions, …" (Marx 1991:906)

One may regard AR unimportant because this particular economic condition would soon disappear due to competition between capitals. However, the possibility of the existence of such particular conditions can be pervasive, especially in an urban context where every piece of land is in high demand for various purposes fragmented by the numerous different possible types of land uses. Scott (1976) has also rightly pointed out this issue saying that.

"In the urban system, landlords certainly earn massive rents due essentially to the scarcity of land equipped with urban infrastructure, including housing." (Scott 1976:132)

In most AR related debates, capitalists were thought to have a passive role compared to landowners. Actually, however, capitalist tenants also have a crucial role in this process because they are willing to pay AR to landowners only when they can get excess profit over and above the production cost and taking AR into account with their ability to withdraw and relocate their capital. Following the argument of Marx implies that the relationship between landowners and capitalist tenants on AR is not unilateral.

"The landowner is always ready to draw a rent, i.e. to receive something for nothing, but capital requires certain conditions in order to fulfil its desire." (Marx 1991:906)

As the market condition of land would determine the affordability of AR for the capitalist tenants, the AR appropriation of the landowners would be forced to change with it. In this context, the relationship between landowners and capitalist tenants on AR is not inevitably favourable for landowners, but rather depends upon economic conditions.

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[21] Scott negates the possibility of a cartel of landowners: "… the real economic and political power of landlords in modern capitalist society is probably fairly negligible, …" (Scott 1976:129)

3-2-3 Monopoly rent

For the feature of AR being identified as a consequence of excess profit from an economic imbalance in a sector, the concept of monopoly rent (MR)[22] has little difference from AR. Marx described MR as a result from a pure monopoly price of a commodity which is determined neither by the price of production nor by the product's value, but rather by the willingness and ability of purchasers to pay. He introduced the concept of this rent twice in chapter 45 and chapter 46 of Capital Volume 3 in his distinction from AR.

"In any case, this absolute rent, … , is simply a part of the agricultural surplus-value, … , its seizure by the landowner; just as differential rent arises from the transformation of surplus profit into rent, its seizure by landed property, at the general governing price of production. These two forms of rent are the only normal ones. Apart from this, rent can derive only from a genuine monopoly price, which is determined neither by the price of production of the commodities nor by their value, but rather by the demand of the purchasers and their ability to pay, consideration of which therefore belongs to the theory of competition, where the actual movement of market prices is investigated." (Marx 1991:898)

"It is necessary to distinguish whether the rent flows from an independent monopoly price for the products or the land itself, or whether the products are sold at a monopoly price because there is a rent. By monopoly price here we mean any price determined simply by the desire and ability of the buyer to pay, independently of the price of the product as determined by price of production and value. … Here, therefore, the monopoly price creates the rent. Conversely, the rent would create the monopoly price if corn were sold not only above its price of production but also above its value, as a result of the barrier that landed property opposes against the rent-free investment of capital on untilled land." (Marx 1991:910)

In these two explanations, while AR is a normal rent which is added to production cost due to landed property resulting in a monopoly price for the land product, MR is an abnormal rent which is exceptionally resulting from an external condition of monopoly price.

However, AR also results from external economic conditions resulting in monopoly prices. Moreover, from the point of view of the capitalist tenants using MR-bearing land, MR has no difference from AR, because this rent which is initially regarded as a windfall would eventually

[22] The term monopoly rent was not named by Marx, but subsequently, the concept suggested by him has been widely called monopoly rent.

become an internal part of the production cost paid by the capitalist tenants[23]. The distinction drawn by Marx between the two thus becomes weak and even meaningless.

However, there can be another way of differentiating the two without this distinction of whether the monopoly price is determined within the inner mechanism of price of production or results from external economic conditions. Uniqueness of land can distinguish the two.[24] MR can exist in a particular land which displays exceptionally good qualities for creating a monopolistic commodity differentiating itself from other lands, whereas AR is a universal rent paid on all lands in a sector.[25]

There is an interesting relationship between MR and AR. In a situation in which a uniquely profitable land produces a particular commodity, the land can yield a large amount of MR. However, if more pieces of land with similar qualities were launched into the market, the situation would be changed. If the launch were successful and the products from the lands were recognized as the same as the original, the capitalist tenants would get the excess profit from selling them at monopoly price too. The landowners of the newly-launched lands would then request land rent as much as the original MR-bearing land yields. As a consequence, they would appropriate the similar amount of rent and the level of MR would probably fall to a lower level as the scarcity of the products would have been reduced. This means that there would be no MR remaining in the sector. According to the change of market conditions, the land rents of the original land and very similar lands would fluctuate together. If AR could be described as a land rent which is commonly appropriated in a particular group of lands regardless of their OCC, then AR would be the correct name for this rent. In an urban context, there are numerous types of uses of land as space, depending on the structure of fixed capital, buildings, etc. This fact increases the possibility of the existence of numerous MRs and ARs arising in a unique piece of space or a group of similar spaces.

To sum up, the competition between capitalist tenants for excess profit transforms unique MR into shared ARs in a sector. Namely, a monopoly of a unique space would be transformed

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[23] In the same context, Lipietz (1985) argued that any distinction between AR and MR is irrelevant.

[24] Reaching the same conclusion that AR can exceed value of the product of the land so that the distinction between MR and AR can be meaningless, Harvey properly suggests that MR and AR can be distinguished as MR in individual level and AR in general level by a particular sector as a whole. (Harvey 1973:182) However, shortly after this distinction, he provides another way of distinction. He suggests AR arises when 'technical and social condition affects a particular sector as a whole' and MR arises when 'producers within a sector establish cartel arrangement among themselves'. Later he seems to develop these concepts of AR and MR in the second distinction into a concept of 'class monopoly rent' (Harvey 1974) focusing on the collective powers of landowners and land users over the AR and MR in land.

[25] For MR in urban context, criteria by Houghton (1993) are noteworthy. He suggested two criteria of 'non-substitutability' and 'consumer sovereignty' for creating monopoly in urban space.

by the competition of capitalist tenants into a broader market of very similar spaces. The amount of both MR and AR depends on the demand-supply conditions of markets. Therefore, the more similar spaces as substitutes entered into the market, the less monopolistic power of landowners and common AR will be.

While MRs are transformed to ARs by this *emulation* process, at the same time, the *differentiation* process endlessly creates new MRs. The differentiation, here, means that new specific spaces enter the market differentiating themselves from others in order to appropriate MR. Capitalist tenants or landowners themselves would try to get excess profit by additional capital investment in land to make it unique. These two processes, along with the movement of capital, are the most fundamental impetuses which shape urban development.[26]

It is interesting to examine how these two processes of emulation and differentiation have certain similarities and contrasts with the production processes in general industry. There are two ways of increasing surplus value other than absolute surplus value. They are extra surplus value by innovation and relative surplus value. Capitalists try to improve productivity by adopting new technology, including new machinery and new manufacturing process. With new techniques, capitalists can appropriate more excess profit by reducing production cost. When other capitalists respond by adopting the same machinery, the social production cost of the product and price of product would be reduced due to improved productivity in the society as a whole. This reduction lessens the burden of the capitalist on the wage of labourer through alleviating the reproduction cost of labour power. This also applies to the endless differentiation process and emulation process. However, the internal mechanisms are somewhat different. The processes in MR and AR are based on the mechanism of increasing market price through monopoly price, whilst those in general industries, Marx explained, are based on the mechanism of reducing production costs through new production technology. However, there exist similar mechanisms in general industries to land rent mechanism. The artificially created and protected ownership, such as intellectual property rights, and patents function, to increase the price of products is in the same way as the mechanism of land rent based on land ownership.

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[26] A study on housing construction in Melbourne by King (1987) shows the two patterns of periods. The first period is characterised by massive construction of similar housing before 1973 and the second period is characterised by differentiated small scale housing development after 1973. Similar patterns are observed in various countries although the periods of different patterns vary.(the U.K.:Malpass and Murie 1982; South Korea:Lim 2005) although the periods of different pattern vary. The first period can be seen as the period of an emulation process for sharing ARs by constructing similar types of housing and the second as the period of a differentiation process for creating MRs with unique spaces. These patterns also can be seen as a transformation of Fordism to Post-fordism in production.

3-3 Land rent in an urban context

Marx's explanation of land rent in urban areas is limited in terms of quantity and level of detail compared with that in agricultural land. The explanation of 'Rent of Buildings' is included in chapter 46 of Capital, vol. 3, and covers just 3 pages. In spite of their limited nature, his comments on rent of buildings are comprehensive enough to guide further theoretical advances for the urban context.

First of all, he argued there would be DR in cases where the lessee could get surplus profit by taking advantage of a 'well-situated building site'.

"Wherever rent exists, differential rent always appears and always follows the same laws as it does in agriculture. Wherever natural forces can be monopolized and give the industrialist who makes use of them a surplus profit, whether a waterfall, a rich mine, fishing grounds or a well-situated building site, the person indicated as the owner of these natural objects, by virtue of his title to a portion of the earth, seizes this surplus profit from the functioning capital in the form of rent." (Marx 1991:908)

He also pointed out the 'prevalence of a monopoly price' with MR and AR from a building site, when he outlined three characteristics of land for building.

"As far as land for building in concerned, … This rent is characterized first by the preponderant influence that location exerts here on the differential rent … ; Secondly, by palpable and complete passivity displayed by the owner… ; finally, the prevalence of a monopoly price in many cases, …" (Marx 1991:908)

DR2 linked with 'the development of fixed capital' was also emphasised as an important factor increasing the rent on buildings.

"The rise in population, and the consequent growing need for housing, is not the only factor that necessarily increases the rent on buildings. So too does the development of fixed capital, which is either incorporated into the earth or strikes root in it, like all industrial buildings, railways, factories, docks, etc., which rest on it." (Marx 1991:909)

The inseparability between 'any production and any human activity' and 'land as space and foundation' was also highlighted.

"Two elements come into consideration here: on the one hand the exploitation of the earth for the purpose of reproduction or extraction, on the other the space that it required as an element for any production and any human activity. On both counts landed property demands its tribute. The demand for building land raises the value of land as space and foundation, ….” (Marx 1991:909)

Based on these basic features of land rent for buildings, how the four types of land rents can be understood in an urban context and how they are functioning will be discussed especially focusing on residential land.

3-3-1 Reproduction of labour power and commuting

A residential space is an essential factor for the labour reproduction process. Every worker has no choice but to use a certain space for reproducing his or her daily labour power. The reproduction process of labour which includes sleeping, eating, excreting, taking a rest, avoiding harsh weather, and even breeding children takes place within a housing space. Housing also entails social aspects of labour reproduction, such as education, health care, and neighbourhood environments.

In addition to these processes, considered in the trade of labour power, this concept of reproduction of labour can be expanded to involve the intermediate processes of commuting before the sales of the labour power in a work place. This makes commuting cost of time cost and transportation cost a part of the whole reproduction cost, as well as the other costs.

The commuting costs mainly depend on the distance between the work place and house. This provides an implication that there could be surplus ‘profits’ available to workers generated by location differences. That is to say, there is an unevenness among houses by location, which would entitle landowners to demand the surplus as land rent of DR in an urban context. In this way, the law of DR using Ricardo’s agricultural explanation of the unevenness of fertility and von Thünen’s theory of the unevenness of location can be taken to be still valid in urban residential context. Harvey (1982) also pointed out the feasibility of existence of DR in residential land relating to reproduction process of labour power.

“The cost of reproduction, and therefore the value of labour-power, is, given Marx’s general rule on transport costs, sensitive to the cost of getting to and from work. If all workers receive a flat wage rate, then those who live in ‘favoured locations’ have a relative advantages over those who live further away. If the wage is set at a level needed to ensure the reproduction of the worker who lives furthest away (as can sometimes happen under conditions of labour scarcity), then all other workers receive a wage somewhat above value. It then follows that those who hold space can convert the excess wage into ground rent without in any way disturbing the value of labour-power." (Harvey 1982:340)

In this brief comment, he has offered a significant insight into urban DR. Of course, there are some inappropriate assumptions which make it difficult to accept the main idea: flat wages, and wage setting based on the worker who lives furthest away. Obviously, there is a vast range of levels of wages and determination of wage is not simple but instead a highly complicated process. Nevertheless, he provides an important point in understanding urban DR: saving in commuting cost lead to an "excess wage" which could be linked to DR converted to rent by "those who hold space" (Harvey 1982:340).

It is clear that there is a reproduction cost gap due to commuting cost difference depending on location of houses. This gap would be appropriated by the landowners[27] as a part of DR because the savings in commuting cost are based on the use of the space which has an advantageous location. This is analogous to the logic used in agriculture to argue that more fertile land allows more surplus profit which is appropriated by the landowner as DR.

The magnitude of the commuting cost gap in an urban residential space would be far greater than that in the agricultural land of von Thünen's theory. This is because commuting takes place on a daily basis while the frequency of farmers' trips to buy farming tools or trade crops in the central market is much lower. Thus the cumulative commuting cost would be reflected to a significant proportion of the whole land rent in an urban context.

As DR is related to residential cost, the relationship between transportation cost and residential cost becomes important in analysing urban residential rent. A representative work in this field is the seminal contribution by Alonso (1964) on the trade-off effect between journey-to-work cost and residential cost. Having started from von Thünen's theory, Alonso turned the focus on the production process in the theory to consumer's demand using bid-rent concept.[28] As a result, the dynamics of land rents beneath the bid-rent on the surface is mainly overlooked in this stream of research. On the other land, the feature of DR theory in an urban residential context is useful to understand some dynamics of land rents.. Firstly, the consequence of the growth and expansion of cities on land rent level can be explained. An increase in population in

[27] As land in an urban residential context is developed with a fixed capital of buildings and the ownership of land on which a building base is often separately shared by multiple people, space-owners would be more appropriate term for the lessor of land in the form of space.

[28] The same origin of the two theories of differential rent in classical political economy and agricultural rent in von Thünen has been correctly pointed out by many authors (Walker 1974, Jones 1978, Persky and White 1988). Considered that the neoclassical urban economics models are based on von Thünen's model, it can be said that they are also originated from the analysis based on the production process in land.

cities corresponding to growth of employment would lead to geographical expansion of cities. Other things being equal, as the city expanded, the average distance of commuting and consequent average commuting cost would increase. This widened gap of commuting cost means that the relative advantages of superior spaces (primarily meaning well-situated spaces) become augmented, leading to an increase in total DR in the city. In brief, therefore, the geographical expansion of a city would increase the total land rent in the city. Secondly, a change in marginal commuting cost can affect the level of DR in a city. The relative gap between spaces would be widened if there is an increase in marginal commuting cost, such as an increase in time cost due to congestion or income increase, or an increase of transportation cost, which would lead to a growth of total DRs in the city. Therefore, any factors which affect the change of commuting cost would influence the level of land rent.

3-3-2 The reproduction of labour power and differentiated preferences for housing

"The residence for your dignity", "The place you live makes what you are"

These are some examples from commercial advertisements for property sales. They are not only marketing catchphrases to target a minority of rich people to live in exceptionally luxury residences, but also a general enticement for people to consume a residence suitable for their living. This advertisement may allow developers collect surplus profit from the monopoly price, appealing the uniqueness of property and stimulating the tastes of the rich who have ability to pay. For a rental market this surplus profit could be seen as MR and for a sales market the capitalised value of MRs would consist of the main part of the surplus profit in an urban context. This type of luxury housing submarket may play an important role in pushing up an average house price. Yet its importance may be less significant in analysing the general structure of housing markets as the key actors in the housing market are the ordinary workers.

Nevertheless, the dynamics of capital movement seeking surplus profit can change this niche market to a market for broader consumers. An appropriation of MR from a unique space would tempt other capital to follow the same strategy with the pioneer capitalist resulting in the provision of similar spaces in the market, which was explained as *emulation* process. This process would form a group of houses with a similar level of common rent of AR. The more similar houses enter the housing market, the less AR would be and the more affordable the houses to ordinary workers. Thus, the unique housing submarket for the rich can be expanded to accommodate a broader class of people.[29]

When considering the relationship between the widened submarket and labour reproduction, the advertisement is rather close to propaganda, encouraging people to reproduce their labour in a proper space. This can be regarded as an outcome of external instigation by capital. The reality of the consumer preference is indicated to be intentionally and systematically produced by capital[30]. The different quality of labour reproduction by consuming differentiated housing is also largely exaggerated by capital in pursuit of an excess profit. From the point of view of the capitalists, the greater the gap between the preference of labour reproductions by consuming different housing product, the more profitable the housing industry is and the more successful the propaganda is.

However, the differentiating process of spaces is also supported by the embedded desire of people. It is difficult to deny that desire for better living or labour reproduction lies in the fundamentals of the housing market as demand. Thus a class or a status of people is often represented by which group of housing they live in.

This combined demand from embedded desire and instigation for the differentiated labour reproduction is revealed as differentiated demand in the housing market. These differentiated demands interact with supplies in each group of houses resulting in different levels of AR. Housing is one of the typical types of goods which have a strong hierarchy due to some innate features of inelastic supply, durability, non-substitutability, and above all necessity. These characteristics increase the possibility of the existence of hierarchically graded submarkets by comparison[31]. In the whole market where the preference for submarkets are uneven, demand would tend to crowd to superior groups of houses first. Because of the limited stock in each submarket, excess demand for the superior submarkets would yield MR or AR in each group of houses..

The dynamics of *differentiation* and *emulation* process for MR and AR are widely observed in the contemporary housing market. Firstly, capitalists in the house building industry are always

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[29] The unique houses which differentiate themselves with massive floor area, luxurious interior, exclusive views or surrounding environments may succeed to keep their position as MR bearing spaces.

[30] Harvey (1974) also pointed out that consumer preference in property market is systematically produced by the class of owners of "resource units" rather than arising "spontaneously" focusing on the struggle between classes. The concept of consumer preference has this feature of passiveness exaggerated by capital. The use of term 'consumer preference' hereafter in this study implies the influence of intentional and systemic instigation by capital.

[31] This lies in the same line with the idea of Chamberlin (1933) where Emmanuel (1985) adopted his concept of monopolistic competition. The concept of 'multiplicity of preference' by 'homogeneous collectivity of consumers' can be linked to this different housing submarkets by structural features, which may have a significant role in explaining absolute rent in an urban context.

trying to create more convenient and favoured types of housing than existing types of housing in a way. At the same time, once a group of housing becomes preferred in the housing market, other capitalists follow to build a similar type of houses. Although the two processes are not as fast as in other more general products due to the inelastic feature of housing supply, these differentiation and emulation processes are shaping the landscape of urban residential area with its perpetuating movement.

3-3-3 The formation of multiple land rents in an urban context

The formation of the structure of land rent by group of houses can be construed in the historical context of the growth of a city. The dominant type of housing depends on the profitability when it is built. The location of the housing stock changes as the city grows and available lands are limited.

Firstly, the level of total rent in urban land and the price of properties are deeply related to the types of housing. In contrast to the single sector assumption in the agricultural context, there are a variety of types of land use forming multiple sectors in urban areas. A piece of land can be used in various forms by land use, building type, infra-structure, density, surrounding environment and so on. The formation of multiple groups of similar lands by these features would eventually set certain levels of AR by each group. For example, ARs between modern 2-bedroom flats and 3-bedroom terrace houses would be different. Even within a same group of 3-bedroom terrace houses, ARs are likely to be different depending on other features, such as whether it has double-glazed windows or a newly furnished kitchen. The types of housing and the resulting space have corresponded to the dominant preference, which would have determined the greatest profitability at those times. For example, if a particular type of housing is dominantly preferred at a certain time, it would be the most profitable, so the type of housing would form the majority of newly constructed houses at that time. The detailed process of the formation of a dominant housing type in a certain period is related to the transformation of MR to AR. If a property capitalist succeeds to create a new favourable type of housing (differentiation), the emulation process would follow, which leads to the creation of a group of housing of a similar houses. This differentiation, emulation and the subsequent formation of a group of houses continue to form multiple groups of houses with different ARs.

Next, a consideration of the fixity of property and the growth of a city with these different types of housing by time and preference highlights an interesting relationship between group of houses and DR. As a city expands, large parts of the newly expanded area will be filled with residential properties. As the supply of residential properties is likely to be influenced by the most preferred type of housing at the time, the newly expanding area would be dominantly filled with a certain type of residence over time. As a city grows in this way with different types of housing being preferred and therefore built in each period, the fixity of land and the durability of building could lead to concentric ring-shaped belts of residential areas of dominant groups of houses. Within each group of houses, the differences in location would be transformed into DR via the excess profit of the workers who used superior residences in terms of location, rather than living in a residence of marginal location. The further a city expanded involving inferior spaces in terms of location, the greater relative differences of housing would be. If marginal commuting cost is constant in a city, the DR level of a group of houses depends on how far they are built from the centre and how far the boundary of the group is. In the case that this can be also applied to the other groups, there can be multiple-levels of DR depending on the physical boundaries of each group.

Therefore, the structure of land rents of housing in an urban context can be modelled as the multiple layers of potential rents by group of houses. Figure 1 shows the structure of land rent of an imaginary city of 3 different groups of houses. DRs in each group vary with the location of each house and the boundary of each group of houses. The more extended a group to outer area, the greater the rent cone of DR of the group would be. In addition to varying DRs, each group also share a common rent of AR and the levels of ARs are likely to be different by group depending on the hierarchy of preference to the groups. Consequently, levels of AR are differentiated by group of houses and each group would internally have different levels of DRs. Therefore the probable structure of total rent would be multiple layers of combination of AR by group and DR within group. The fact that a plot of land may have different levels of potential rents makes a land of good location in the less favourable group exposed to the pressure of redevelopment. For example, the properties in the group 1 in Figure 1 are likely to be redeveloped to the group 3 of highest potential rent. This is not because AR of the group 3 is the greatest among the three groups (actually the group 2 has the greatest AR), but because the sum of AR and DR in the group 3 is the greatest.

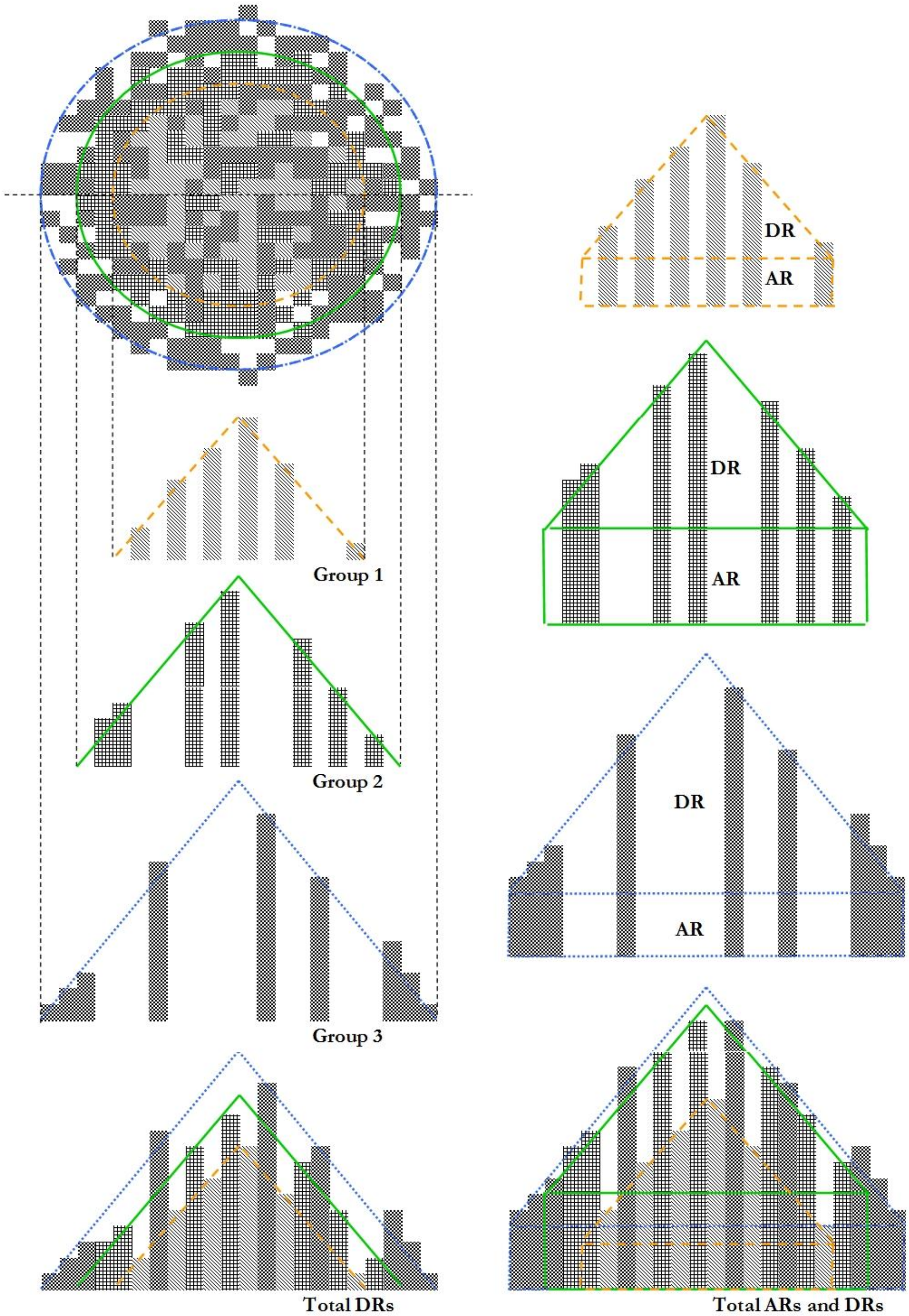

Figure 1 The probable structure of land rents of housing in an urban context

Based on this structure, the detailed process of the transformation of MR to AR can be understood with a series of diagrams in Figure 2. When a successful launch of a new favourable space takes MR, other similar spaces would enter the market. This forms not only a certain level of AR (less than previous MR) in the group but also different DRs in the group. As more spaces enter the market, the level of AR decreases. As a consequence, except for MR-bearing land, every piece of land would have a land rent structure of the combination of AR and DR.

A bid rent curve appears to be unique because highest bid rents shape the whole rent curve of a city. The underlying potential rents, however, also exist and influence the future changes in not only land use but also group of houses in residential land use. Thus, it is appropriate to analyse land rents in housing markets by different groups of houses which have different combinations of AR and DR.

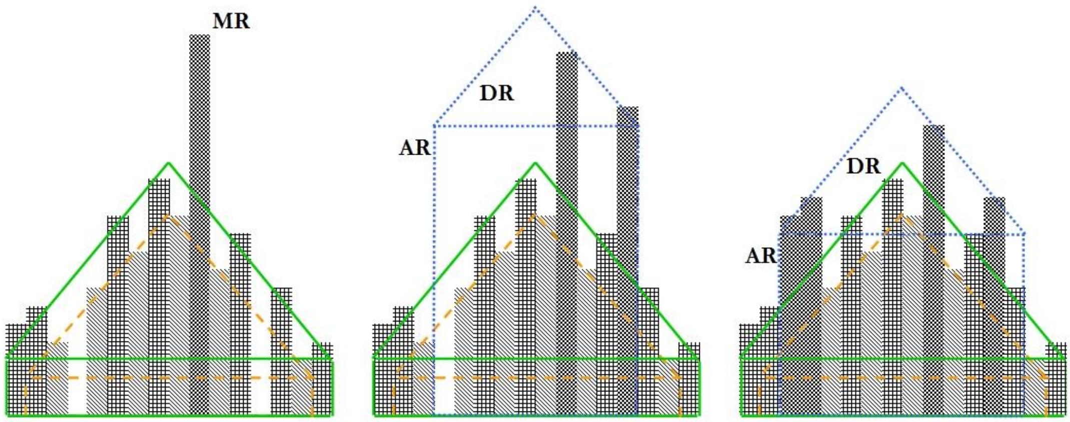

Figure 2 The transformation of MR to the combination of AR and DR

3-3-4 Investment on residential land and the shift between groups of houses

Capital investment on the space for improvement is inevitably involved in the competition over how to make a space more favourable than others (differentiation for MR) or how to make spaces similar to MR-bearing space (emulation for AR). This necessarily relates to the concept of DR2.

As DR2 represents the gap between rents before and after the extra capital investment less the interest cost of invested capital, DR2 would appear as the actual increased total rent of a compound of AR and DR, or MR by capital investment on space. This can be seen as the process that the space would transfer into another group of houses when an extra capital investment changed its physical features and equipment. Before the expiration of the contract, the increased excess revenue by this extra capital investment would be seen as mere excess profit to the capitalists. After expiration of contract, however, it would be regarded differently by the landowners: 1) If the investment improves accessibility to central area leaving physical features same as before, the excess profit from the investment would be DR; 2) If the investment creates a new type of space, the excess profit would initially be MR; 3) If a space become very similar to one of the spaces in an existing group of lands, the excess profit would be the difference between combinations of AR and DR of the two groups before and after the transfer of the space.

Therefore, DR2 may not be a perpetual and tangible concept of land rent but a transitional and nominal concept. The real form of the increase of land rent by successive investment on the same land to landowners would be transformed into DR, a combination of AR and DR in a newly-entered sector, or MR in the new space to which the investment successfully created.

Although the form of the capital investment in residential lands varies from a whole new development to a refurbishment, the investment is normally expected to yield higher rent than the current use of space. The difference of land rents between the current use and the potential use is what developers are always seeking. The concept of 'rent gap' introduced by Neil Smith (1979) explains this difference. He tried to explain the fundamental impetus of gentrification with the gap between the potential level of rent and current level of rent. The detail of the profit from the investment is likely to be the balance of the sum of new land rents which will be appropriated from the sum of invested capital, opportunity cost, and the previous sum of land rents.

A space in a group of houses can transfer to another group through the process of property development. The s*hift between groups of houses* can be used as a term meaning these transfers which enable a space to appropriate a different combination of AR and DR, or MR. This concept of shift between groups of houses is crucial to understanding the underlying impetus of capital investment on residential space, which aims to acquire higher sum of rents in the upper group of houses. For example, if a 2-bedroom bungalow which yields a certain combination of AR and DR is changed to a 2-storey 3-bedroom detached house which is assumed to be more popular and profitable than 2-bedroom bungalow type, it could yield different combination of AR and DR in the upper group of houses.

Given a considerable part of profit from property development originates from land rent, capitalists in the building industry would consider the property type and location for potential land rents in order to maximise profit. This is well highlighted in Marx's comments.

"It is impossible nowadays for any contractor to get along without speculative building, and on a large scale at that. The profit on the actual construction is extremely slight; the main source of profit comes from raising the ground rent, and from the clever selection and exploitation of the building land."   (Marx 1992:312)

"… particularly where building is carried on factory-style, as in London, it is ground rent and not the houses themselves that forms the real basic object of speculative building … … the builder makes very little profit out of the building themselves; he makes the principal part of the profit out of the improved ground rents."   (Marx 1991:909)

As capitalists in the building industry regard the return from the development as mere profit, the rate of profit in the industry may be seen higher than others. This supports the argument of Harvey (1982) that the influx of capital into built environment has eased the crisis of capitalism by absorbing the part of excess capital otherwise doomed to bring a fall in the rate of profit. However, there are limits to this appropriation of profit in the building industry. Firstly, what proportion a capitalist would take in excess profit entirely depends on the balance of power between capitalists and landowners. Landowners would not let capitalists take all excess profit but would try to appropriate the excess profit from the capitalists as much as possible. In the case of the merge of the ownership of land with property capital, the unity could appropriate all the excess land rents without these conflicts. But if capital has to pay part of a potential increase of land rents to the landowner in the process of the merge, the amount of the profit would be reduced. It can even have a loss, if it is the case that the capitalist paid too much for the purchase of land. The second limit comes from the change of land rents in the property market. Especially, the level of AR depends on the economic conditions arising from the imbalance between supply and demand. The changes in preference or supply in a group of houses could influence the level of AR. This would mean that the rate of profit in this industry would depend on the change in land rent and the balance of power between landowners and capitalists. Nevertheless, it is definite that space of land provides a great deal of opportunities for capital in terms of accumulating profit and for capitalism in terms of easing over-accumulation. In this vast space of possibility, the construction industry tries to increase profit through various ways, such as purchasing land in advance of change in regulation on land or stimulating the consumer's desire and preference to live in a particular type of place.

3-4 Conclusion

Throughout this theoretical analysis, there has been an attempt to establish a consistent land rent theory in an urban context. In the process, the product of the land in an urban context was reviewed first. The relationships between the four categories of differential rent, differential rent 2, absolute rent, and monopoly rent were reviewed and applied to an urban context.

Major findings in the theoretical analysis are as follows.

1. The product of the land in a residential space is suggested to be labour power. The product of the land is often misconceived as buildings. However, it is more appropriate to regard buildings as a type of fixed capital in an urban context. The view on the product of the land as labour power enables us to understand the relationship between the use of space in residential land and the reproduction of labour power in terms of commuting and differentiated preference for groups of housing.

2. The difference from commuting cost due to locational advantage could be transformed to a part of differential rent in a residential area. The surplus of savings in commuting cost from the locational advantage of land could be appropriated by landowners as differential rent. Thus, location differences in a residential area differentiate the reproduction cost of labour power, and the savings in commuting cost from the reproduction of labour power could be transformed to a part of differential rent in an urban context.

3. It has been suggested that the source of absolute rent is a particular economic condition which allows capitalist tenants to earn excess profit from using land. This particular condition also benefits landowners, by enabling them to demand this part of the excess profit from capitalist tenants as absolute rent. The technical condition of low organic composition of capital for the existence of absolute rent in a sector assumes that the rent is allowed when landed property can block additional capital investment on marginal land in the sector where there is excess surplus value over the price of production. This should therefore satisfy the condition that the rent must come from the surplus value produced in the sector. However, this technical condition for an existence of absolute rent may be inappropriate as the flow and mixing of surplus value across all sectors can be hardly blocked by any barriers due to the ever greater mobility of capital in the contemporary capitalist mode of production. What enables the appropriation of absolute rent under landed property is the particular economic condition in a sector creating excess profit which makes capitalist tenants use the spaces in spite of the rent rather than the condition of low organic composition of capital in the sector.

4. Given that the technical condition of low organic composition of capital is discarded in explaining absolute rent in an urban context and it is determined by external economic condition, the concepts of monopoly rent and absolute rent seem to be indistinguishable. The possible

yardstick which can be used to differentiate them is whether the monopolistic rent is solely appropriated in a particular space or commonly in a group of similar spaces. When a particular space monopolises and bears monopoly rent, other capitalists are likely to launch similar spaces in order to share the monopolistic rent if they can. As a consequence, this emulation would form a group of spaces and the group would share a similar amount of rent which can be seen as absolute rent. Capitalist developers, at the same time, may try to differentiate their land to appear unique to allow the sole appropriation of monopoly rent. These two processes would result in various groups of housing.

5. The concept of differential rent 2 is related to the differentiation and emulation of spaces for monopoly rent and absolute rent, as the two processes necessarily requires additional investment on the land. Given differential rent 2 as the gap between rents before and after the extra capital investment, it can be seen as a transitional and nominal category of rent which is eventually transformed to other forms of rent. If the investment succeeded to make a space unique creating monopoly price, the actual form of differential rent 2 would be monopoly rent. If it succeeded to make a space similar to existing monopoly rent-bearing land so that it could share in the excess profit, a combination of absolute rent and differential rent in the sector where the space entered would be the actual form of differential rent 2.

6. As a city expands with the growth of employment and population, it is very likely that ring-shaped residential belts of different types of housing would surround the centre of the city. The fixity and durability of buildings would result in different groups of housing which would have been built in different times. Each group of houses would have a different level of absolute rent as a sector and differential rents in the sector, which makes multiple levels of potential combinations of absolute rent and differential rent in a piece of land. This difference of potential land rents in one site is one of the most dynamic impetuses of regeneration in urban areas.

Location differences in a group of housing would contribute to differential rent, while preference differences for the reproduction of labour power between groups of housing would contribute to absolute rent. Differential rent within a residential area and absolute rent by group of houses and its associated implication to the reproduction of labour power should be an integral part of the analysis of the structure of land rent in an urban area.

Chapter 4.
The structure of housing submarkets

In this chapter, the structure of housing submarkets will be analysed on the basis of the concepts of land rents developed in the previous chapter. The structure of the housing submarkets is complicated, associated as it is with various centres of employment, different accessibilities to central areas, different types of residential properties, ethnic concentration, the uneven distribution of infrastructure, education and health-care facilities, and other factors which create numerously fragmented spaces in urban area. These factors make a whole housing market divided into numerous submarkets by their features. Therefore, proper analysis on the housing submarkets need to precede the application of land rent theory to empirical analysis. However, the structure of housing submarkets itself is also inextricably bound up with land rents. Thus, the structure of housing submarkets will be discussed alongside the concepts of land rent. In addition to this, the dynamic interactions between differential rent and absolute rent within each housing submarket and between housing submarkets will be examined. The structure of the housing market and its dynamic mechanism, based on land rent theory, will be empirically verified and explored in the housing markets of three cities in the next three chapters.

4-1 Introduction

In a city, there are numerous centres of employment incorporating various types of jobs of manufacture, retail activities, public services, clerical work, the provision of healthcare and education, and all other activities which employ people and attract people to live nearby. The location of such activities may be determined by various factors such as organic growth in an existing town, a firm's pursuit of optimization of profit, or an external political decision planning an artificial centre of employment[32]. In any case, each employment centre would be surrounded by a residential area so that workers could live nearby and reproduce their labour power. (Harvey 1982) This complex comprising a centre of employment and its surrounding residential area is a basic unit of a city, and will be defined as a *residential sphere* hereafter. One residential sphere may comprise a whole city, such as in the case of a small medieval city. In

[32] Canary Wharf in London and YeoUiDo and GangNam in Seoul are typical examples of centres of employment which have been developed by political decision plannings.

contemporary cities, however, the majority of cities have a merged form of multiple residential spheres.

The size and scale of a centre of employment in a city can vary immensely. It can be one individual retail shop in an ordinary high street, an office building, a block of buildings in a city where many firms agglomerate, a distinct region administered by a single council, a region including several local councils, or a large industrial complex. Some of them might be isolated, while others might be so close that they overlap with each other. As smaller employment centres, such as retail shops and office buildings, are often close together and merged in a contemporary city, they form clusters of centres of employment. The residential area would then surround the clusters and form a bigger residential sphere. The growth of employment in the clusters and the following expansion of the residential spheres would lead to more overlap and merger between different residential spheres at a higher level. All of these changes in the clusters of employment and surrounding residential area make it difficult to develop relevant research on the housing market. One of the main issues in the research about the housing market is the need to identify housing submarkets.

This chapter is an extension of a body of research into the housing market that emphasise a proper identification of housing submarkets, assuming the whole housing market as a non-unitary system. Watkins (2001) pointed out that the concerns of researchers in relation to housing submarkets had subsided as the emerger of neoclassical urban economics in the 1960's diverted concerns to the relationship between accessibility and house price, on the assumption that a housing market in a city is a unitary entity. A sizable volume of hedonic house price literature succeeded neoclassical urban economics in housing studies, without much concern over the housing submarkets. However, as the complexity of the housing market in the contemporary metropolitan cities makes the explanatory powers of the analyses less significant, the concerns over the proper identification of housing submarkets has been revived. Maclennan and Tu (1996) emphasised the importance of the proper division of housing submarkets as follows:

"If a housing system, in any cross-section study, comprises a series of sub-markets with different degrees of disequilibrium rather than a unitary, coherent system, then conventional city-wide hedonic and demand function estimates may be mis-specified. Even more important, such reductionist analysis disregards the real nature of signals that the system is producing and, by default, disregards the adjustment processes involved." (Maclennan and Tu, 1996:389)

A proper division of housing submarkets is not only important in order to analyse the structure of house price but also crucial to applying appropriate policies in planning, housing, and transportation (Goodman, 1998; Jones, 2002). In this context, many researchers have tried to find proper housing submarkets based on geographical area, physical or neighbourhood housing characteristics or demander group (Ball and Kirwan, 1977; Bourassa et al., 1999; Brown and Hincks, 2008; Goodman, 1981; Hincks and Wong, 2010; Jones, 2002; Maclennan and Tu, 1996; Michaels and Smith, 1990; Palm, 1978; Royuela and Vargas, 2009; Straszheim, 1975).

However, as Watkins (2001) pointed out, there is the problem of the absence of a coherent definition of the housing submarket and little consensus when identifying a housing submarket in practice. Therefore, firstly, the concept of the housing submarket needs to be clarified. The criterion of a proper division of the housing submarket has mainly been regarded as the uniformity of house prices or the existence of substitutability between houses in each housing submarket (Fisher and Fisher, 1954; Grigsby, 1963; Jones, 2002; Rapkin et al., 1953; Watkins, 2001). As Stigler and Sherwin (1985) requote the view of the market by Marshall, following Cournot and Jevons, a market for a product is the place where the product is traded on a uniform basis:

"Thus the more nearly perfect a market is, the stronger is the tendency for the same price to be paid for the same thing at the same time in all parts of the market: but of course if the market is large, allowance must be made for the expense of delivering the goods to different purchasers." (Marshall, 1920, Book V Chapter I)

Therefore, given that a perfect housing submarket has a coherent price system, the main criteria should focus on which method of division is better for understanding the structure of house prices in defining each housing submarket.

In the review of the research on housing market subdivision, Watkins (2001) found that structural division, by property characteristics, and spatial division, by geographical region, are the most common methods used and argued that the best way of identifying housing submarkets is to apply these two criteria simultaneously. There is less variance in defining structural housing submarkets by property characteristics as physical differences in houses, such as floor areas, housing type, number of rooms or number of bathrooms, are relatively clear and the associated demand for houses also shows coherent differences (Allen et al., 1995; Dale-Johnson, 1982). The concept of 'housing product groups'[33] by Maclennan and Tu (1996) is parallel to that of the

[33] A group of housing which shares similar physical characteristics are defined as group of houses, which lies in the same line with structural housing submarkets. Sectoral housing submarkets are more

structural housing submarket. Unlike in the division of structural housing submarkets, the methods used to identify spatial housing submarkets vary greatly and there is little theoretical basis for the division (Watkins, 2001). The most similar concept to the spatial housing submarket is housing market areas (HMAs). Jones (2002) pointed out that the access space model, developed in neoclassical urban economics (Alonso, 1964; Evans, 1973; Muth, 1968; Wingo, 1961), implicitly assumes that the housing market is defined by the area where households trade off journey-to-work costs for housing expenditure, which is parallel to the system of spatial labour markets using travel-to-work areas (TTWAs). He subsequently argued that the assumption of the monocentric employment location in the approach is problematic as it is difficult to apply the model to metropolitan cities, where the tendency to decentralisation of employment from the city centre exists.

Many researchers have adopted various approaches in their empirical analyses in order to find a proper method of identifying structural and spatial housing submarkets. The housing submarkets divided by each approach were then mostly tested with statistical methods. Census boundaries or local government administrative boundaries were used in the analysis by Schnare and Struyk (1976) and Ball and Kirwan (1977). Adair et al. (1996) and Watkins (2001) used the *a priori* knowledge of the local housing market for their analysis. Some of the research used statistical methods to identify housing submarkets initially, after pooling all the housing data (Bourassa et al, 1999; Goodman, 1981; Leishman, 2009; Maclennan and Tu, 1996). Some researchers used the knowledge of local real estate agents (Brown and Hincks, 2008; Michaels and Smith, 1990; Palm, 1978). Brown and Hincks (2008) used the Intra-Max procedure, based on the migration flows within a housing submarket, after setting core HMAs in consultation with real estate agents. The research by Jones (2002) was also based on the migration flows within a housing submarket, which is assumed to be a contiguous area comprising groups of settlements with a high degree of housing market self-containment. The research by Royuela and Vargas (2009) relating to Catalonia's (Spain) case is also in same line with the aforementioned. They compared different approaches to commuting and migration data in explaining house prices. The result, using the Theil Inequality Index, demonstrates that the commuting algorithm is shown to be superior in explaining the uniformity of house prices than the migration approach. Recently, the geographical information systems (GIS) has been used to identify housing submarkets. Bibby (2005) explored the landscape of house prices in the West Midlands area of the UK. Hincks and

differentiated than this as the same groups of houses can be divided further by different social and environmental features.

Wong (2010) adopted statistical analysis and visual GIS mapping of commuting flow to explore the nature of housing and labour market interaction.

Although all these areas of research highlight various aspects of the possible criteria for the identification of housing submarkets, there has been little attention to the interaction between residential spheres (a unit consisting of a centre of employment and surrounding residential area) and associated patterns of commuting and rent in large cities.

This chapter is to suggest an alternative method of identification of spatial housing submarkets and to examine dynamic changes of land rents in each submarket. The relationship between savings in commuting costs and house prices is reviewed first. The interaction between residential spheres is examined, focusing on the relationship between the changes in rent curve and the subsequent changes in the direction of commuting. A probable form of a merged structure is suggested based on the process of expansion-overlap-merger between residential spheres. The associated changes in rent curves and the subsequent changes in commuting pattern can be used as the criteria for the identification of spatial housing submarkets.

4-2 Spatial housing submarkets

4-2-1 Residential sphere and differential rent

The feature of differential rent as a surplus has been highlighted in section 3-2-1 in agricultural context. An application of the concept to an urban context focusing on labour reproduction process then has been attempted in section 3-3-1, which is partly indebted to Harvey's idea. On the assumption that wage rate and other costs of reproduction are uniform in a city, the difference in commuting cost can be diverted to rent. The effect of a 'trade off' between commuting saving and rent level would put residents of a residential sphere in the same position in terms of economic cost regardless of where they live. Differential rent in the urban context reflects the savings of labour reproduction cost, especially the saving in commuting cost in the whole labour reproduction cost. If it is assumed that marginal commuting cost is constant, the saving in commuting cost will increase linearly as the distance from an employment centre increases.[34] Thus, the better the accessibility to a centre of employment is, the greater the saving

[34] There is no substitution between input factors in a structural housing submarket because the density of land use can be assumed to be same in the submarket. This would make the rent curve linear. In addition, this study assumes the constant marginal commuting cost and the linear rent curve for simplicity. In realty,

in commuting cost. If the saving in commuting cost is transferred to landowners as differential rent, in coordinate axes where the horizontal axis represents the distance to an employment centre and the vertical axis represents saving in commuting cost and differential rent, an upward sloping commuting cost line and a downward sloping differential rent line can be drawn like figure 3. In this simplified graph, the point where the differential rent line meets the horizontal axis can be seen as the outer boundary of the residential sphere, because the saving in commuting cost is zero at the boundary of the residential sphere.[35]

The trade-off effect between commuting cost and housing expenditure on rent is built upon the rent theory of von Thünen, which is in line with the concept of differential rent in the classical political economy (Jones, 1978; Persky and White, 1988; Walker, 1974). The basis of the rent is mainly locational advantage, which is expressed economically in money terms. The location advantage incorporates various aspects, including accessibility to education and leisure facilities, as well as accessibility to centres of employment. Although the importance to house prices of being in the catchment area of a good secondary school is increasing in many cities (Cheshire and Sheppard, 1995), the savings in commuting costs are regarded as the greatest contributing factor to the locational advantage identified to date. The observation of the trade-off between the distance from a centre of employment and housing expenditure is based on this reflection of locational advantage in accessibility to the level of rent. Although pensioners or families valuing educational accessibility often play a pivotal role in the formation of house prices, ordinary workers occupy the majority of the space in urban residential areas for the labour reproduction process. The ordinary workers' rent bids play a decisive role in the formation of rental levels in housing markets. For the same reason, the majority of urban monocentric city models assume that commuters have a dominant position in setting the level of rents.

If a city is monocentric there is a trade-off between commuting costs and housing expenditure; a structural housing submarket in the city may be regarded as having a unitary house price system, where all houses in the sector can be substituted equally. However, if the city is polycentric, the substitutability between houses is not established across the whole city. When a

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however, marginal commuting cost is not constant. It tends to be higher in central area because time cost and external cost arise in central areas due to congestion. An exponential model of rent curve is then more realistic.

[35] The total rent line does not meet the horizontal axis at the boundary of the residential sphere because there are other components included in total rent reflecting building construction cost and other types of rent such as AR.

city of polycentric employment centres is divided properly into areas where the trade-off relationship becomes unitary, each area can be regarded as a spatial housing market area with substitutability. Therefore, focusing on the unitary trade-off relationship in each submarket can be a crucial criterion to divide the entire housing market into spatial submarkets. There is a body of research focusing on the trade-off between commuting costs and housing expenditure, which supports the TTWAs and labour market area. As Jones (2002) argued, however, a further theoretical development for the non-monocentric city, where a unitary trade-off effect is irrelevant, should be followed so that empirical analysis can be supported.

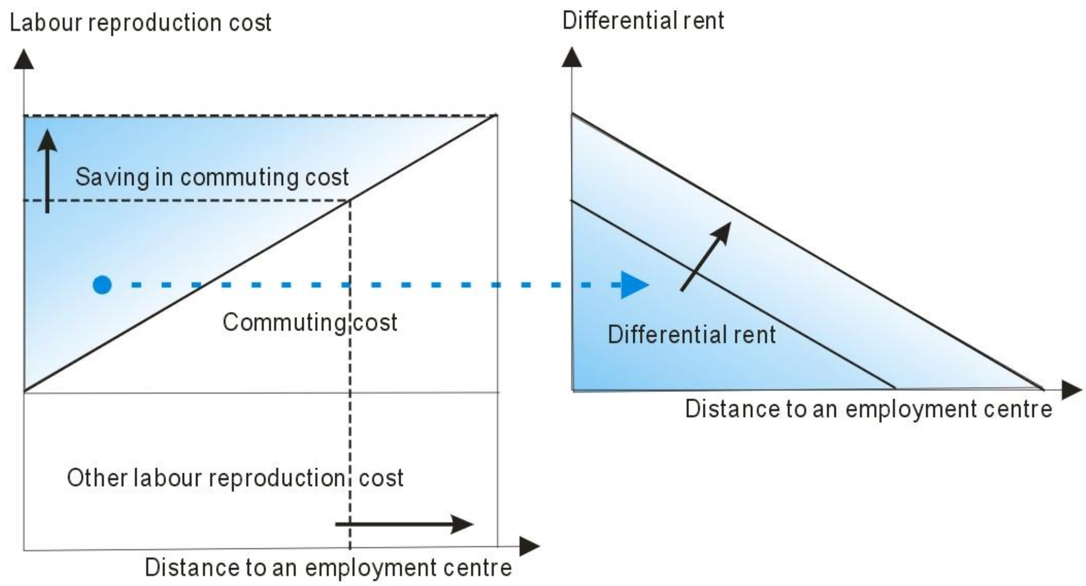

Figure 3 Differential rent in the urban context

4-2-2 Expansion, overlap, and merger of residential spheres

Given a structural housing market of similar physical characteristics, including housing type and floor area, the assumption of the marginal commuting cost as being a constant would make the rent curve linear[36]. Thus, the better the accessibility to a centre of employment, the greater

[36] There is no substitution between input factors in a structural housing submarket because the density of land use can be assumed to be same in the submarket. This would make the rent curve linear. In addition, this study assumes the constant marginal commuting cost and the linear rent curve for simplicity. In reality, however, marginal commuting cost is not constant. It tends to be higher in the central area because time cost and external cost arise in central areas due to congestion. An exponential model of rent curve is then more realistic.

the saving in commuting costs and the level of the rent is. The rent containing this aspect of locational advantage in the whole rent is referred to as locational rent. Total rent and house price includes building construction cost and other types of rent, such as scarcity rent, as well as this locational rent. This section focuses on locational rent in dividing spatial housing submarkets, on the assumption that other factors would be the same in a structural housing submarket.

The planar shape of residential spheres would be a circle if there were no geographical or regulatory restrictions on expansion, as most people would want to live close to their work place. If centres of employment were located at a great enough distance from each other, the surrounding residential areas in each sphere would not overlap, which is the case of independent housing markets in an area. The growth of each centre of employment, however, would lead to an overlap of residential areas associated with the expansion of each sphere. Therefore, it is necessary to examine closely the consequent relationships between 1. the growth of centres of employment and overlap; 2. overlap and expansion; and 3. the expansion and merger of spheres.

The growth of employment in residential spheres could cause the peripheral residential areas to overlap the neighbouring residential spheres. Under the assumption of a uniform density of land use for residence in a structural housing submarket, the overlap of multiple spheres would lead to a shortage of dwellings as much in each side of the overlapped areas as inside them, which leads to a further expansion in the direction of the non-overlapped areas of the spheres. The level of rent then would be higher than in the case of growth without overlap (see Figure 4).

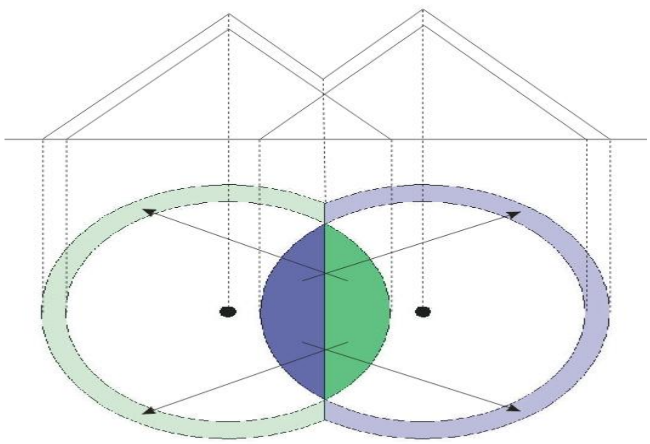

Figure 4 Overlap of two residential spheres

Next, an intensified overlap could lead to a new phase in the dynamics of merger between residential spheres. When a residential sphere that has a faster growth rate of employment leads the overlap of multiple spheres, the sphere of faster growth would also dominate the further expansion of spheres. From a certain point, the boundary of the dominant residential sphere, under the influence of the faster growth of employment, would exceed the boundaries of other residential spheres. This uneven growth of employment would eventually merge multiple spheres into one sphere (see Figure 5). The dominant centre of employment would then lead to further growth and other, previously independent, centres of employment and residential spheres would become sub-centres and sub-spheres to the merged residential sphere.

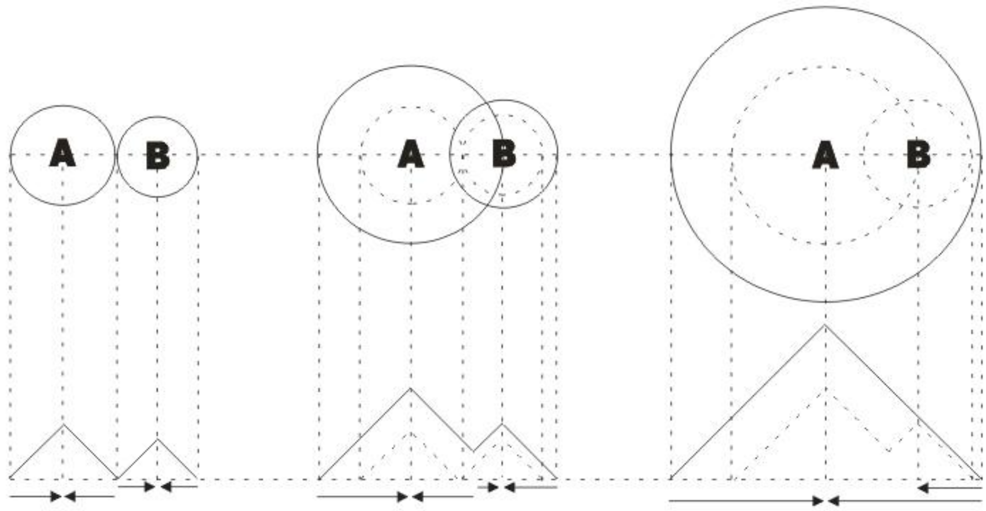

Figure 5 Growth, overlap, expansion, and merger process and associated commuting pattern of two residential spheres

Lastly, the influence on the merged sphere of the growth of employment in a sub-centre could be examined. If the employment in a sub-centre grows, the sub-sphere would need a larger residential area for the workers. Subsequently, a part of the existing dwellings for the workers who work in the dominant centre would be replaced by those for the workers of the sub-centre, because the sub-sphere could not expand physically in this phase. Therefore, this occupation of dwellings by the workers in the sub-centre would eventually lead to a further expansion of the whole merged sphere. An accelerated speed of growth of this sub-centre can make the boundary of the sub-sphere surpass the expansion of the boundary of the merged sphere, so that the sub-sphere could partially separate from the dominant sphere and the peak of the rent cone of the sub-sphere could escape from the dominant rent cone, resulting in a break in their unity.

4-2-3 The spatial structure of merged residential spheres and changes in commuting patterns

This merger process is significant in understanding the spatial structure of housing markets in metropolitan cities that have multiple centres of employment. The growth of a residential sphere causes not only a geographic expansion of the residential area but also an increase in rent levels. The wider a residential sphere expands, the greater the total level of rent increases. At the same time, a merger of residential spheres means not only a geographic merger of multiple circular spheres, but also the regulation of the rent levels in the whole merged sphere by the rent cone of the dominant residential sphere. If a fully merged residential sphere is under the influence of one fully merged rent cone, the whole housing market within the sphere can be regarded as one market (see the last diagram in Figure 5), meaning that regarding previous sub-spheres as independent housing markets is irrelevant. The substitutability between houses (Jones, 2002; Watkins, 2001) then exists in the whole housing market. If a partly merged residential sphere has multiple independent peaks of rent cones the whole housing market within the sphere could be separated into multiple areas along the hollow borders of merged rent cones (see the middle diagram in Figure 5). The unitary trade-off effect and substitutability between houses can exist in each area as a spatial submarket.

The merger process between residential spheres suggests the possible structure of housing market of a merged form of a few dominant residential spheres, which have multiple sub-spheres of different sub-centres. These also lead to a possible explanation of why the level of rent in a city is often regulated by a few main centres of employment, although it has many sub-centres, such as town centres.

It is also crucial to the understanding of the housing market structure to examine the changes in inner commuting patterns of a city, as well as the structure of rent in the city. In an independent residential sphere, the majority of commuting would direct towards the centre of employment shaping a circular form. In the overlapping zone of two partly merged residential spheres, there would be two groups of commuters heading in opposite directions. Out of this zone, commuting would direct towards each centre of employment shaping a circular form in each non-overlap sphere. However, once one dominant sphere had merged with the others and its level of rent became the level of rent in the whole merged sphere, there would be a significant change in commuting patterns. In Figure 5, commuting to centre B in the overlap zone exists before the full merger but disappears afterwards. This is because the level of rent in the sphere of centre A now has a dominant influence on the level of rent in the whole merged sphere. It means that commuters to centre B in the zone may not be able to afford the increase in rent in the previously overlapped zone. They may find it rational to reside on the other side of centre B. However, commuters to centre A may be content to reside in any place in the merged sphere, as the rent level of the sphere of centre A becomes the level of rent in the merged sphere. Thus, commuters to A may reside anywhere in the area, whereas commuters to B tend to reside in the opposite side of B to centre A. The consequence is that commuting towards the dominant centre comes from all directions, while commuting towards sub-centres is limited in direction. These characteristics of the commuting pattern can be an important criterion in working out the spatial structure of the housing market. This can provide a useful clue to answer the related questions of which centres are dominant centres, which are sub-centres in a city and to what degree dominant residential spheres are overlapped or independent in an urban area.

Practically, this theoretical examination of the merger process of residential spheres can be used to identify and divide spatial housing submarkets in a city.

4-2-4 Spatial housing submarkets and polycentric urban areas

The confusion between sub-centres and housing submarkets as well as the clarification between monocentric city and polycentric city can now be reviewed on the basis of this merger process between multiple residential spheres.

Firstly, a sub-centre does not necessarily mean an independent housing submarket. As multiple residential spheres (units of a centre of employment and surrounding residential area) merge together, the rent level in the merged market is mainly determined by the few dominant residential spheres in merger process where multiple sub-spheres subsequently become subordinate parts. Thus a sub-centre does not necessarily consist of a whole housing submarket. It is more reasonable to understand a sub-centre as a subordinate centre of employment in a merged housing market. Therefore the identification of sub-centres[37] may not be consistent to the identification of housing submarkets. The housing submarkets are likely to be influenced by few dominant centres of employment in a form of merged residential spheres.

According to the merger process between residential spheres, the dominant centres in an urban area would have peaks of house prices and commuting inflows from all sides. The

[37] For example, Giuliano and Small (1991) identified 32 sub-centres in the Los Angeles region using employment density and total employment.

dominant centres which have these prominent price peaks and commuting inflows from all sides can be the centres of each housing submarket. The geographical boundary of an independent housing submarket can be deduced by the outer boundary of each house price cone and by the outer boundary of a hierarchical group of areas in commuting pattern. In case of partly merged residential spheres, the verges between two housing submarkets can be identified by the hollow border between house price cones or by the areas which have diverged major outflow commutings to dominant centres. This identification of major peaks of house price cones and centres of commuting inflows can be a sensible way of spatial division of housing submarkets.

Secondly, the criteria of separating the monocentric city and the polycentric city also need to be clarified. The concept of a polycentric city is based on the assumption that major centres of employment are not concentrated in one area but widely distributed in multiple areas. As was previously pointed out, it is better to understand sub-centres as subordinate centres in a merged residential sphere, in contrast to the major centre of employment in it. It would be inappropriate to argue that the existence of various sub-centres necessarily means that the city is a polycentric city in this sense, if they are just subordinate centres in a merged residential sphere. For example, London is widely assumed to be a prototype of a monocentric city but it has multiple sub-centres of employment such as the West End, the City, and Canary Wharf. It may be more proper to state that a polycentric city has multiple spatial housing submarkets, if and only if it has multiple house price peaks and commuting inflows.

4-3 Sectoral housing submarkets

4-3-1 Absolute rent from structural differences

Capital investment into space is embodied in the form of land improvement, infrastructure or building construction. Its main features of fixity and durability distinguish it from other types of investment. The land rent from a specific space faces a new phase with this capital investment as the use value of space shifts to different levels. The expected increase of land rent after capital investment into land has been a major impetus of developments in an urban area. The physical features after capital investment have always been under the influence of the maximum economic return in a given legitimate use of land. Except for some cases in which local or central government is involved, the economic return from capital investment into space has been mainly determined by the market condition of supply and demand. Given the inelastic supply of space, demand by differentiated preference for groups of housing has dominantly influenced market condition. Sometimes capital investment in land creates a whole new unique space leading to the appropriation of MR, sometimes it simply emulates the one of the existing spaces to share the existing level of land rent in the target space, AR. As explained in the previous chapter, these are *differentiation process* and *emulation process*, and are the major ways in which property development has taken place in urban area. As the consumer preference[38] is often determined and changed by time, the dominant types of properties may vary by period. As a result of these processes, the urban area would have groups of different properties which have similar structural features, such as building type, number of rooms, and number of bathrooms. Although the periods when they were built are different, the groups exist at the same time with different consumer preference. Each group of properties with similar features in a residential area can be defined as a *group of houses* (and this is done conceptually in section 3-3-2 above and empirically in the three case study chapters below). The physical characteristics of properties in the structural housing submarket lie in the same line with the concept of the group of houses.

In contrast with differential rent which comes from the internal comparison of excess profit, absolute rent is a common rent by each group of houses, which is determined by market condition. The groups of houses are likely to have an favorable economic condition caused by scarcity from limited supply and demand for housing as a necessity, which, in most cases, is likely to lead to AR. The level of AR varies with each group of houses, as market conditions of the preference and level of available stocks by each group of houses are different. In other words, different degrees of economic abnormality in equilibrium by each group of houses may determine different levels of AR.

Given that the available housing stocks of each group of houses are limited, the preference for each group of houses would have an order of priority. As consumers of space use are likely to prefer the superior group of houses, and as stocks in each group are limited, the demands for each group are likely to cascade from the upper group to the lower groups forming certain levels of AR organised by each group.[39] As demand can flow up and down by various factors, ARs in each group of houses are likely to perpetually fluctuate with tension. This is the competition of

[38] For the implicit meaning of 'consumer preference' see footnote 30

[39] This is consistent with Chamberlin's (1933) concept of 'multiplicity preference functions' of 'homogeneous collectivity of consumers' in his hypothesis for the theory of monopolistic competition (requoted from Emmanuel (1985)).

capital on space *between* groups of houses. If the total stock of all groups of houses meets the total demand of households, there is a possibility that the most inferior group of houses yields no AR. However, even in this case, the upper groups of houses would yield certain levels of AR.[40] This hierarchy in levels of AR by group of houses is one of the main features of structure of land rent in urban space.

There are many factors that can influence the levels of AR by each group of houses, such as advertisement and supply change. The most likely strategy adopted by capital on space to increase AR is advertisement. Capital on space tries to attract space users by exaggerating and stimulating their concern about labour and social reproduction projected on to the housing. The developers who normally try to sell property with the price including capitalised land rents are eager to enhance the use value of housing that they have constructed. If they have already paid a lump sum of money to landowners for the development, their desperation to pursue this would be exacerbated. Scarcity often arises through the historical aspect of housing supply. This would be the case of housing stocks that are particularly in demand by consumers, which have been built in previous decades and cannot be emulated by present capital investment. For example, a typical Victorian house in London cannot be emulated in the present. After all, the level of AR in a certain group of houses depends on the real stock of it as well as consumer demand.

4-3-2 Absolute rent from differences of social reproduction

The differentiated preference for the housing market is likely to be influenced by concern about not only labour reproduction and but also social reproduction on residential space. First of all, this is likely to be reflected in AR by each group of houses. Structural features like building type, floor area, floor plan, number of bedrooms, and number of bathrooms are undoubtedly the major determinant in the formation of groups of houses. This is one of the reasons why housing submarkets sorted by these physical features are called structural housing submarkets. However, social aspects may also influence the formation of housing submarkets, as well as the structural features. Theses social features in housing market division have been

[40] Some authors like Kautsky, Lenin, Namboodiripad (1984) and Patnaik (1999) argue that nationalisation of land would make AR disappear. However this feature of different ARs by group of houses suggests that their claims are not appropriate at least in urban context. Massey(1977) also comments on nationalisation of land. However she focuses on the change in the contradictory relationship between landownership and capital accumulation arguing that nationalisation would not change the fundamental contradiction between the two.

emphasised by Harvey and Chatterjee (1974), Edel (1975), and King (1987). Ethnic concentration or income level, institutional (financial and governmental) difference by local area, distribution of 'good' schools, and the proportion of male professionals employed by local area were identified as main social features which influence the level of land rents in urban areas.

However, the different categories which the authors argue to be under influence of these social features vary. Harvey and Chatterjee regard the subject to the social features as "class monopoly rent" which means AR in urban context as understood by Harvey (1974), while Edel (1975) defines it as monopoly rent and King (1987) as differential rent. On the basis of the definitions developed in the previous chapter, monopoly rent is not an appropriate category of land rent to be affected by the social features. Monopoly rent is a result of a unique valued attributes for limited number of housing units, while social features influence the level of rent of entire housing stocks in an area altogether. King (1987) states that social features contribute to make differences of labour and social reproduction as measured by individual housing so it can be seen as difference between individual spaces within a housing submarket. However, social features of neighbourhood influence housing not as an individual but as an area. For example, ethnic concentration does not affect the land rent of individual houses by degree, rather it is likely to affect the land rent of a certain locality as a whole. The presence of a 'good school' also has a similar mechanism of influence on land rent. It is likely to influence not by degrees of how close a house is to a 'good school' but rather by whether or not a house is in the catchment area which is applicable to the 'good school'. The appropriate category of land rent influenced by social features is AR. Therefore social and environmental features of neighbourhood also influence the AR of a certain group of housing as well as structural features.[41] For example, British council housing[42] is classified into different housing submarket, not just because of the structural features of building but also because of social features. A housing submarket created by these structural features and non-structural features can be called the *sectoral housing submarket*.

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[41] A group of houses which has similar structural properties can be divided into further submarkets by its social features of locality.

[42] Council housing is the name of public (social) housing in the U.K. which have been built and managed by local authorities. Once it consists of more than a third of total housing stock in the U.K., but after privatisation policy of 'Right to buy' scheme under the Thatcher government the majority of the stock have been transferred to private owners and remainders are managed by local authorities or non-profit organisations.

4-4 Dynamic movement of land rents in housing submarkets

4-4-1 Dynamic movement of land rents within a housing submarket

The movements of land rents within a housing submarket can be categorised into three cases. The first case is when the commuting cost per distance increases, perhaps because of a transportation fare rise followed caused by an oil price increase, or an increase in the time cost because of traffic congestion. The differences of commuting cost for each residential space would be consequently widened, and the gradient of the DR line would become steeper. As this change would affect all groups of houses in the same manner, there would be no change in the level of AR or in the spatial boundary of the housing submarket.

The second case is when the imbalance of supply and demand for a certain sectoral housing submarket is aggravated by the factors such as increased preference or limited stock. For example, an increase in single-person households would increase demand for one bedroom flats, or an increase in immigrants with large families or low incomes might increase demand for 4 or 5 bedroom houses. A strict planning regime or geographical limit of city would also contribute to a limit of supply of housing stock leading to an increase of AR.[43] This change in market conditions for a certain sectoral housing submarket would lead to a change in the level of AR in the submarket leaving DR unchanged.

The third case is when employment grows and a housing submarket expands to accommodate the housing demand from the increased labour force in the housing submarket. In this case, two consequences would follow: The physical expansion of the housing submarket and the alleviation of imbalance in supply and demand in the housing submarket. This would influence changes in both DR and AR. Alleviated imbalance would result in a decrease in AR while the physical expansion of a housing submarket would eventually result in an increase of DR, as the increased level of commuting cost in the area would enhance the relative advantages of well-located spaces in terms of commuting cost. The gradient of DR would not change in

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[43] Gyourko (2006) found that inelastic supply of land contributes to higher rate of increase in house price than housing stocks comparing changes of house price and housing stocks among US metropolitan areas. San Francisco, New York, and Boston were identified as the cities where the growth of house price is greater than number of stocks due to stricter planning regime and geographical limit in expansion, whereas Las Vegas and Phoenix were identified as the city where the growth of housing stocks is greater than house price due to relatively lighter regulation and less limit in expansion. But his extensive research does not highlight the following changes of DR by the expansion of a city. The interactive movement of both AR and DR are explained in the following.

this case of expansion. The construction of a dormitory-town in the outskirts of a city is a typical example of this case. The change in total rent level, however, depends on the extent of the fall in AR as is shown in Figure 6.

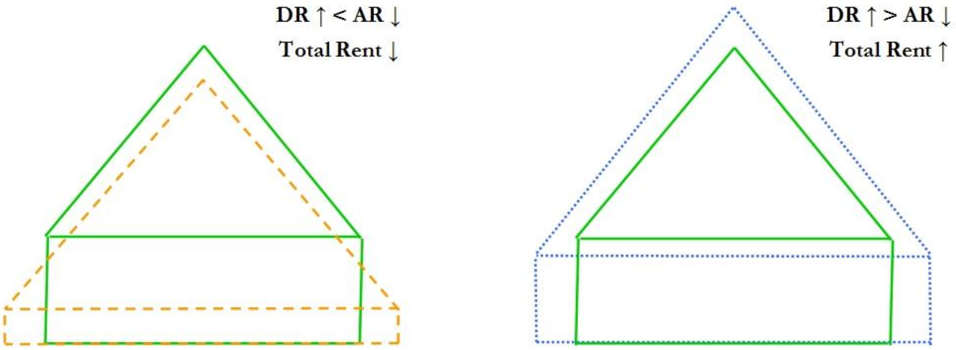

Figure 6 Different effect of an expansion of a city on the total level of land rents (same gradient of DR and different fall in AR)

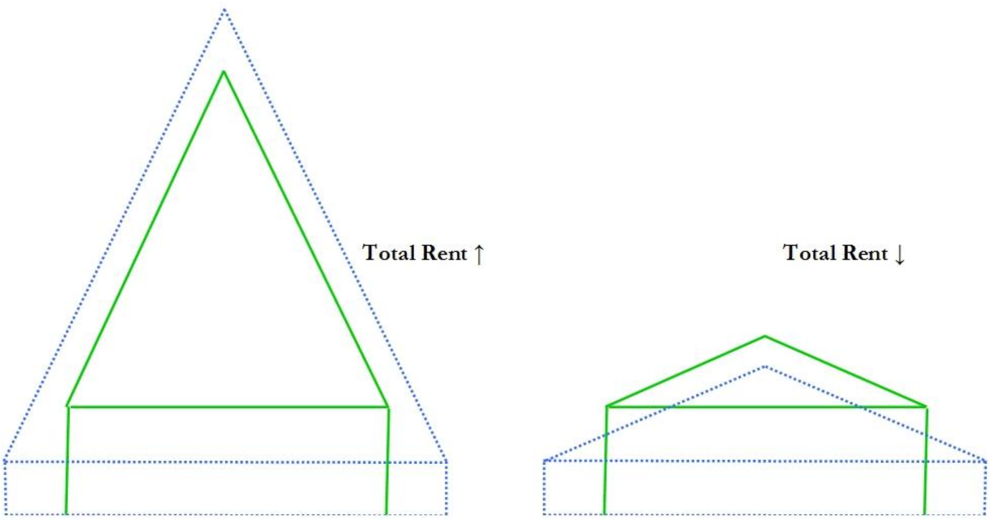

Figure 7 Different effect of an expansion of a city on the total level of land rents (different gradient of DR and same fall in AR)

It is generally accepted that a fall in AR level would lead to a fall in the total level of land rents and house price. However, it could also increase the total level of land rents, as an expansion of a city has opposite effects on DR and AR. If a housing submarket has a relatively gentle gradient of DR line, the fall in AR caused by an increased supply of housing stock after an expansion of a city would outweigh the increase in DR. However, in case of a relatively steeper gradient of DR line, the increase in DR would outweigh the fall in AR. These two different effects are shown in Figure 7.

4-4-2 Dynamic movement of land rents between housing submarkets

An expansion of a city is quite a normal phenomenon as employment grows in the city followed by an increase in the supply of housing around the centre. The tendency which causes the dominant type of housing to vary by time, in addition to the main features of fixity and durability of buildings, creates a unique structure of housing submarkets in the city. It is a multiple ring shape of groups of housing around city centre: older types of houses in the central area and newer types of houses in the outer area. This is a typical historical process in the formation of housing submarkets in most of the old cities. As DR reflecting commuting savings is mainly determined by spatial boundaries, the housing submarkets would have different levels of DR with the same gradients. At the same time, each housing submarket is likely to have its own level of AR too.

The existence of different housing submarkets in a city provides the major impetus in dynamic movements of capital movements in the city. The different structures of total rent of AR and DR in a city mean that there are multiple layers of potential land rents in all spaces in a city. This means that every piece of space has land rents of current housing submarket and potential land rents of other housing submarkets simultaneously. Thus, the judicious use of capital investment to upgrade a housing submarket to the most preferred could yield greater land rents and create a huge profit from trading the space in a capitalised price. The existence of multiple layers of different land rents defined by housing submarket and the gap of land rents in spaces is the most fundamental impetus of dynamic movement of capital in an urban space in the name of regeneration.

The spatial expansion of a housing submarket would increase the level of DR in the submarket, as the gaps between commuting savings are widened. This is likely to increase the total level of land rents on top of the AR. The shortage of housing stock from the growth of employment does not necessarily lead to an expansion of of the area of a spatial housing submarket. The housing stock can be increased by an intensive development within the area. In this case, there can be an opposite change in AR. An increased supply of the housing stock without an expansion of the submarket would cause the level of AR to fall in the submarket. The changes of the AR in the submarket are likely to influence the levels of land rents in other housing submarkets as the expansion of the submarket absorbs part of the demand for housing as a whole. Demands for each housing market are also affected by levels of AR while ARs are likely to be determined by demands in each housing submarket. These changes in ARs between housing submarkets can be caused by different stimulation for demand of different housing markets. The changes in preference would be reflected in demand in each housing submarket, and be realised in the form of ARs in housing submarkets. It would lead to the perpetuating movement of levels of land rents in each housing submarket, which would be followed by capital investment.

4-5 Conclusion

After introducing the necessity of division of submarkets by residential spheres, each with their own employment centre, the dynamic process of expansion - overlap - merger of residential spheres is analysed with the help of differential rent lines and cones, which form spatial housing submarkets. As all dominant housing types built in distinct time periods are different, the housing market is also differentiated by physical properties of housing which are the main constituents of structural housing submarkets. In addition to this, social features such as ethnic concentration, uneven distribution of educational, and other facilities, or environmental features distinguish housing submarkets in the same structural housing submarket. The level of absolute rent varies by these sectoral housing submarkets. Thus, a whole housing market can also be divided by sectoral housing submarket through these structural features and social and environmental features. In this context, a relevant unit for analysis of urban housing market is a certain group of houses with similar social and environmental neighbourhood in a certain spatial housing submarket.

The dynamic movements of land rents and the followed movements of capital in the space *within* a housing submarket fall into three cases: 1) when the commuting cost per distance increases due to some reason; 2) when the imbalance of supply and demand for a certain sectoral housing submarket changes; and 3) when the workforce expands and a housing submarket expands to accommodate the housing demand from the increased labour force in the housing submarket. The dynamic movements of land rents and following movements of capital in the space *between* housing submarkets are also highlighted: 1) the existence of different sectoral housing submarkets in a space provides the major impetus of regeneration in the city, and 2) changes of economic condition with supply and demand in a housing submarket would lead to the perpetual movement of levels of land rents in other housing submarkets, which will be followed by capital investment in the spaces.

Empirical data analysis in the next chapters will be based on these criteria of division in housing submarkets. The results from the analysis will reveal the existence of multiple levels of land rents in space and the dynamic movements of them over time in three different cities: London, Seoul, and Los Angeles

Chapter 5.

Spatial analysis of the housing market in London

5-1 Introduction

5-1-1 Premises for empirical analysis

Three cities - London, Seoul, and Los Angeles - have been selected for empirical analysis in order to investigate the structure and dynamic changes of land rents from residential area point of view. London is selected as a classic type of monocentric city, Seoul as a tricentric city, and Los Angeles as a polycentric city. In addition to this, the three cities are located in three different regions, in Europe, Asia, and America, and they are all metropolitan cities with populations of around 10 million each. Analysis of the three metropolitan cities across different spatial and contextual backgrounds can be used to validate the theoretical findings about the structure and dynamics of land rents in an urban context.

For empirical analysis, there are three problems which need to be clarified practically. The first problem is the availability of the land rent data. All residential land is used in the form of a space which is created through a mixture of the land and the buildings on it. However, house rent makes no distinction between contributions for the land and for building. Therefore, to collect the land rent data is practically and conceptually difficult. The house rent data is the next best source for analysis of land rent, considering that the variation and the absolute contribution from the building to house rent is relatively smaller than the rent for the land. Adam Smith argues that building rent can be distinguished from land rent as the sum of the return from initial capital invested for a building and the depreciation cost. In this manner, the contribution from a building as house rent can be calculated to extract the level of land rent. However, the house rent data is also very limited as the rental housing stock is smaller than the owner-occupied stock and the rental data is generally not included in housing statistics. It is much easier to replace land worth in all regions and countries through using house price data, which is more readily available. Although the house price data includes various noise factors, such as the speculation on future price rises or falls, interest rates, and transaction costs, it can be used as an alternative data to land rent as the basic foundation of the house price is the capitalised rent on space. For practical availability, this study employs the house price data as a main source for the following analysis, in spite of the various limitations inherent in using house price as a proxy of land rent[44].

The second problem is the division of sectoral housing submarkets. In theory, there could exist hundreds of sectoral housing submarkets, divided by not only structural characteristics, but also social and environmental neighbourhood characteristics, and institutional characteristics, as examined in the previous section 4-3. A structural housing submarket itself can be regarded as a sectoral housing submarket when there is little difference in social and environmental neighbourhood features across the whole housing market, whereas it should be subdivided further into multiple sectoral housing submarkets when there is considerable difference. For an empirical analysis, it is difficult to differentiate sectoral housing markets by social and environmental neighbourhood features around them with clear criteria. For this reason, this study regards structural housing submarkets as sectoral housing submarkets focusing on the structural factors such as dwelling types, number of bedrooms, number of bathrooms, and the range of floor area. The most dominant types of sectoral housing submarkets based on structural features are selected for empirical analysis. Table 1 shows the selected sectoral housing submarkets by city[45].

Table 1 Selected sectoral housing submarkets by city

	London	Seoul	Los Angeles
Sectoral housing submarkets	3 bedroom house 2 bedroom flat	4 bedroom apartment 3 bedroom apartment 2 bedroom apartment	3 bedroom detached house 2 bedroom condominium

The third problem is the division of spatial housing submarkets. In reality, a metropolitan city has multiple centres of employment. Some of these multiple centres are main centres and others are sub-centres. As accessibility to an employment centre is hypothesised as one of the major factors determining the level of differential rent in an urban context, a proper subdivision of spatial housing submarkets is the most crucial and, at the same time, the most difficult process

[44] For example, the level of land rent of a piece of land would vary with the density of land use (floor area ratio). The relationship between the land elements in the price of an apartment in a dense block is different from that of a single-family house on its own plot.
[45] These sectoral housing submarkets are selected because they are the most common types in each urban areas. For detailed figures, see section 5-2-1, 6-2-1, and 7-2-1.

in the empirical analysis. For a proper subdivision of spatial housing submarkets, two methods are adopted. Firstly, the shapes of 2-D contours and 3-D surfaces of house prices are examined by embodying them into tangible form. As the location of houses does not exist in the form of surface but a point, the embodiment of house prices needs to be based on the interpolation of the level of house prices at unknown points, using the level of house prices in known points. In constructing the surfaces of house prices of a city, a method of stratified sampling by local authority can be used. The associated data for each sample house is then collected. In order to control the variances in structural characteristics, two or three dominant groups of houses, which have the same building type, the same number of bedrooms, and the same number of bathrooms are selected. For the same reason, house prices are used in the form of the house price per unit floor area.[46] A piece of GIS software, Surfer, produces the 2-D contours and 3-D surfaces of house prices in a city, organised with the house price data by location. Secondly, commuting patterns are mapped. The house price surfaces might not be enough to figure out spatial housing submarkets in a city, because house price is also affected by various factors other than accessibility to the centre of employment, such as educational facilities, the environmental condition, and the status or reputation of the neighbourhoods. These other factors can influence house prices so the house price surfaces might not be enough to identify spatial housing submarkets. The commuting pattern, however, represents the key spatial relationship of residential spheres. Examining commuting flows with a focus on the movements from one area to others can provide a crucial tool to identify spatial housing submarkets. A piece of social network analysis software, Pajek, produces maps which show the relationships of multiple areas to commuting flows. A set of commuting data showing origin and destination by local authority areas can be converted to a readable map of commuting flows between areas.

5-1-2 Introduction

London is the capital of the United Kingdom (UK). It is normally used to mean Greater London, which forms the biggest metropolitan city in Europe and includes parts of the post code districts of Kingston upon Thames, Twickenham, Uxbridge, Harrow, Watford, Enfield, Ilford, Romford, Dartford, Bromley, Croydon, and Sutton as well as the postal area of London.

[46] The unit of house prices are unified to 10 dollars per m^2 in order to 1) control variance of floor area and 2) compare it with other international figures. Exchange rates of 2 \$/£ and 1000 \\/\$ is applied for the currency conversion over all period.

Greater London covers 1,572 km^2 and its official population was 7,500,000[47] in 2006, equalling a population density of 4,758 people per km^2. This is the administrative area of Greater London. This study deals with the metropolitan area of London in terms of commuting, which is based on Travel to Work Areas (TTWAs)[48]. This London TTWA accommodates around 9,300,000 people and covers 2,729 km^2.[49] In the following analysis, London can be taken to mean the London TTWA. The main transport in London is public transportation including train, underground, bus, and overground; people do also use private transport, predominately cars, bicycles and walking, although the congested roads and 'Congestion Charge'[50] road toll discourage private car ownership and usage in the city, especially in and near the centre.[51]

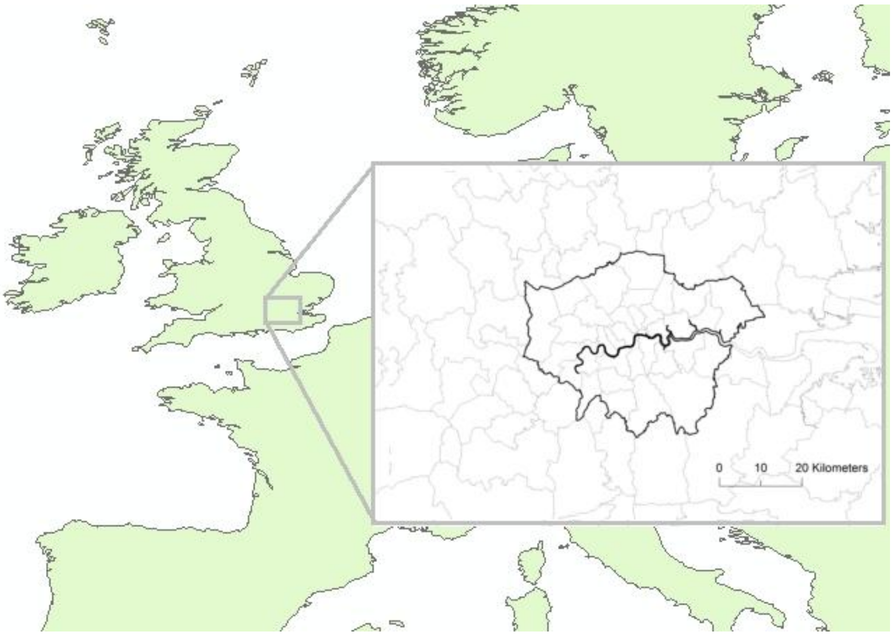

Figure 8 Location of Greater London

There are broadly 2 main types of accommodation in England: houses (82%) and flats (apartments) (17%). The proportion of flat accommodation is greater in London than in

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47 Source: the Office for National Statistics (ONS)

48 A definition of a zone based on commuting from the joint work carried out by the Office for National Statistics and Newcastle University

49 The Office for National Statistics, 2007, Travel-to-Work Areas: the 2007 review

50 London Congestion Charge scheme was introduced in 2003 to reduce congestion in central London and raise fund for improvement of transport in London. According to this scheme, any vehicle entering congestion charge zone between 7:00 a.m. to 6:00 p.m. (Monday to Friday) has to make certain level of payment, which is currently 10 pounds per day in 2011.

51 Transport for London, 2007, London travel report 2007

England as a whole, being houses (55%) and flats (43%). In detail, there are 5 main types of accommodation in dwelling stock in England. They are semi-detached house (32%), terraced house (28%), detached house (22%), purpose-built flat (13%), and conversion flat (4%). In Greater London the dominant forms are terraced house (32%), purpose-built flat (32%), semi-detached house (18%), conversion flat (11%), and detached house (5%).[52]

Around 35% of newly built houses from 1991 to 2010 were 3 bedroom houses and around 64% of newly built flats in the same period were 2 bedroom flats in England. In Greater London, around 44% of newly built houses from 1991 to 2010 were 3 bedroom houses and around 59% of newly built flats in the same period were 2 bedroom flats.[53]

The tenure type of dwelling stock in England falls into the three major categories of owner-occupied, social renting, and private renting. Among the 20,452 thousand dwelling stocks in England, the proportion of owner-occupied properties is 68%, social renting including renting from local authorities and registered social landlords is 19%, and private renting accounts for the remaining 12%. In Greater London, however, the proportion of owner-occupied properties falls to 56% while the proportion of social renting and private renting rises up to 26% and 17% respectively.[54]

5-2 Commuting patterns and centrality

The commuting pattern is the most direct demonstration of centres of employment in a city. Having argued that the residential sphere consists of a centre of employment and the surrounding residential area, the directions of commuting between sub-centres in merged residential spheres reveals the hierarchical relationship between them. Using the commuting pattern, spatial housing submarkets can be identified.

5-2-1 Data & range of analysis

Travel flows collected from labour market statistics organised by local authority from the UK 2001 Census were used for Network Analysis[55]. The data was collected from the official

[52] Source: 2007/2008 Survey of English Housing
[53] Source: 1991/2010 National House-Building Council (NHBC)
[54] Source: 2001 U.K. Census; Bowie (2010)
[55] It is more often referred as social network analysis. It has emerged from sociology but spread out to

labour market statistics website, Nomis[56], which is part of the Office of National Statistics. The local authorities, of which there are 33 in London, 47 in the East of England, and 67 in the South East of England are set as a basic unit of commuting. The travel flow data contains the place of residence [origin], the place of work [destination], and total number of commuting people. A network analysis programme, Pajek, is used for the analysis.[57] As the data for the programme, Pajek needs to use a particular form of '.net' file which includes numbers and identities of members, the location of each member, and the flow from one member to others represented by values of weight. For this, the commuting data needed to be modified to a '.net' file form[58].

Firstly, the origin-destination matrix from all 147 local authorities of Greater London and East and South East of England to all 147 local authorities were constructed for the network analysis. As a result, a total of 21606 pairs of origin-destination data were created. In order to identify the relationship between local authorities, the commuting from an origin to itself and flows of 0 trips are removed. As a result, a total of 17785 pairs are left. For a simple visualisation, three thresholds of number of trips are used. There are 374 pairs of origin-destination commutes where the trip exceeds 3000, comprising of 49.2% of the total trips across 147 local authorities. There are 184 pairs where the trip exceeds 5000 comprising of 33.4% of total trips, and there are 70 pairs whose trip exceeds 8000 comprising of 17.7% of total trips. The details are in the following table 2.

Table 2 The number of commuting trips in London

Threshold	Number of pairs of origin – destination	Total number of trips	Percentage (%)
Total	17785	4564603	100
3000	374	2246920	49.2
5000	184	1524625	33.4
8000	70	808025	17.7

Source: UK Census 2001

variety of other fields including anthropology, biology, economics, geography, and psychology. It focuses on the complex sets of relationships between members or agents in a system. Based on influences or flows from one member to others it highlights centrality, hierarchy, cluster, and inner structure. It is also very useful to visualise commuting pattern and hierarchy in commuting system in a city.

[56] https://www.nomisweb.co.uk/Default.asp

[57] Pajek is one of the most commonly used pieces of software for social network analysis.

[58] See appendix 5-4

5-2-2 Commuting patterns & centrality by local authority

In the following maps of commuting patterns, each vertex represents the centroid of each local authority, the size of each vertex represents the number of inflows of commuting to each vertex, and the arrows show the directions and the volume of commuting trips.

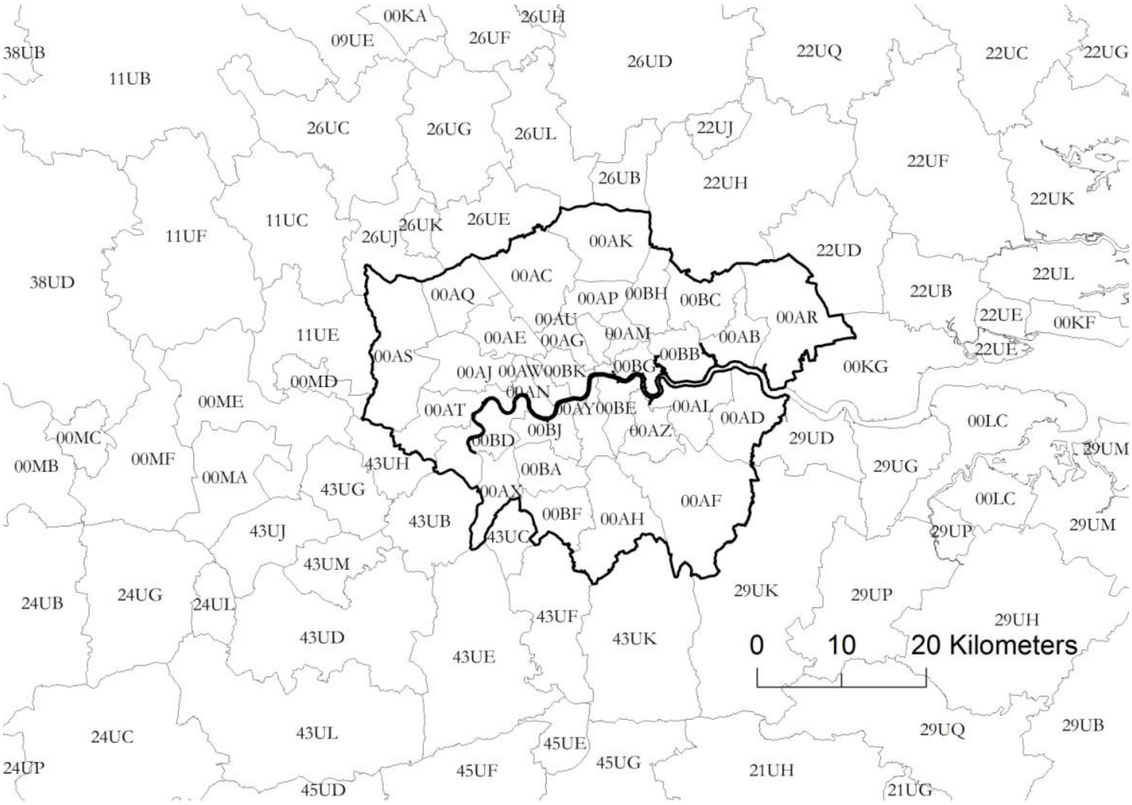

Figure 9 ID codes of local authorities in London and nearby South East

Table 3 ID codes of local authorities in London

Local authority	ID code	Local authority	ID code	Local authority	ID code
Barking and Dagenham	00AB	Hackney	00AM	Lewisham	00AZ
Barnet	00AC	Hammersmith and Fulham	00AN	Merton	00BA
Bexley	00AD	Haringey	00AP	Newham	00BB
Brent	00AE	Harrow	00AQ	Redbridge	00BC
Bromley	00AF	Havering	00AR	Richmond upon Thames	00BD
Camden	00AG	Hillingdon	00AS	Southwark	00BE
City of London	00AA	Hounslow	00AT	Sutton	00BF
Croydon	00AH	Islington	00AU	Tower Hamlets	00BG
Ealing	00AJ	Kensington and Chelsea	00AW	Waltham Forest	00BH
Enfield	00AK	Kingston upon Thames	00AX	Wandsworth	00BJ
Greenwich	00AL	Lambeth	00AY	Westminster	00BK

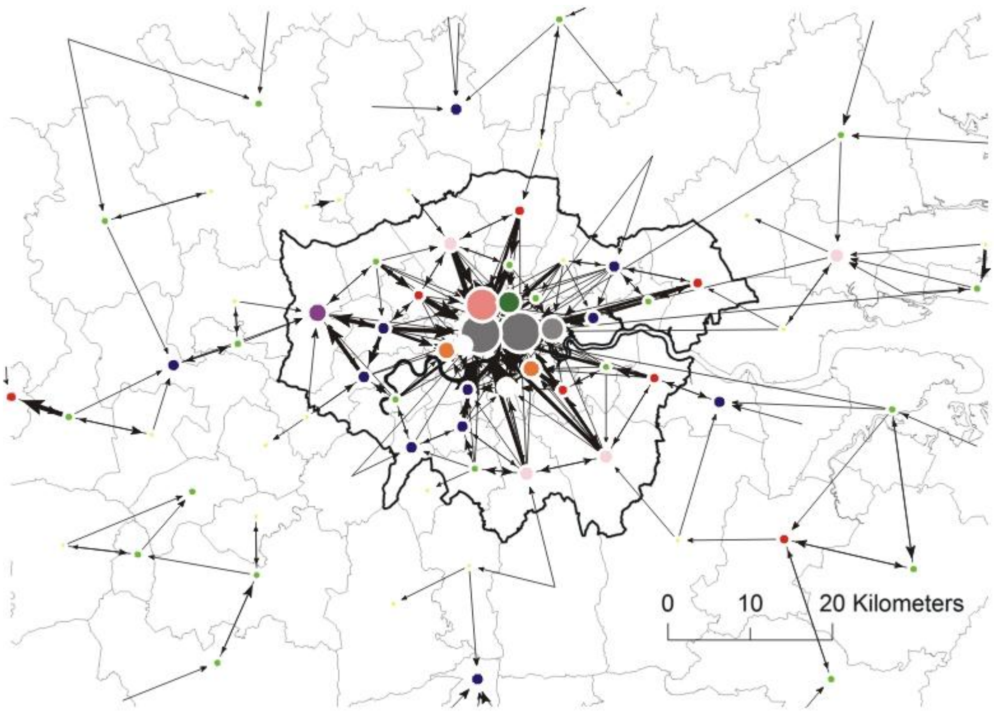

Figure 10 Commuting pattern and centrality by local authority in London (over 3000 trip)

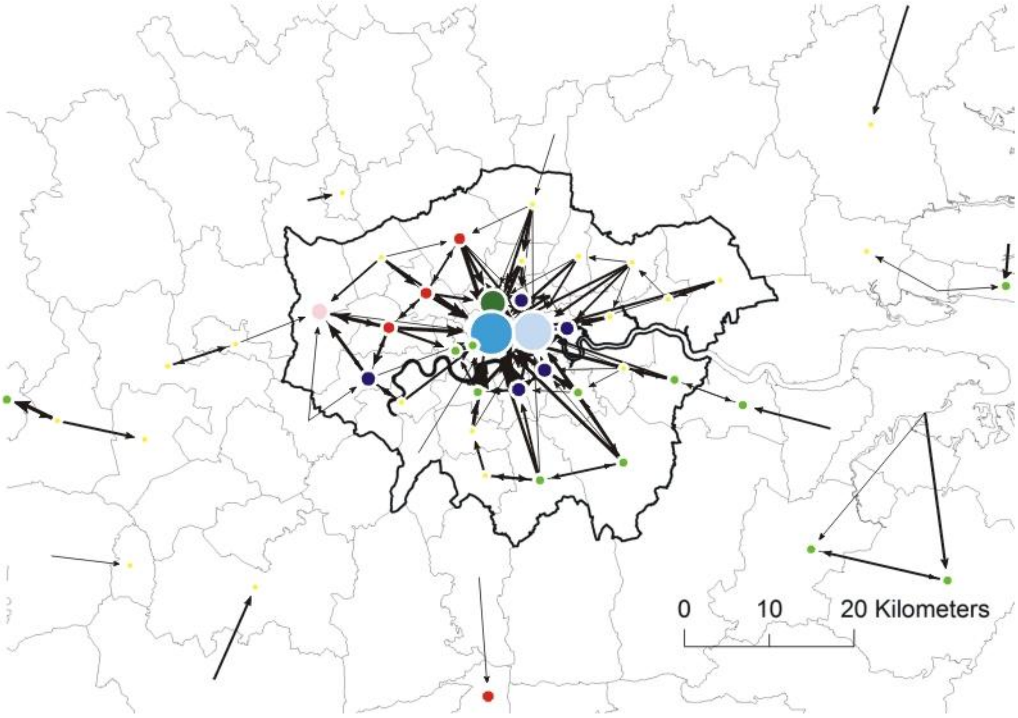

Figure 11 Commuting pattern and centrality by local authority in London (over 5000 trip)

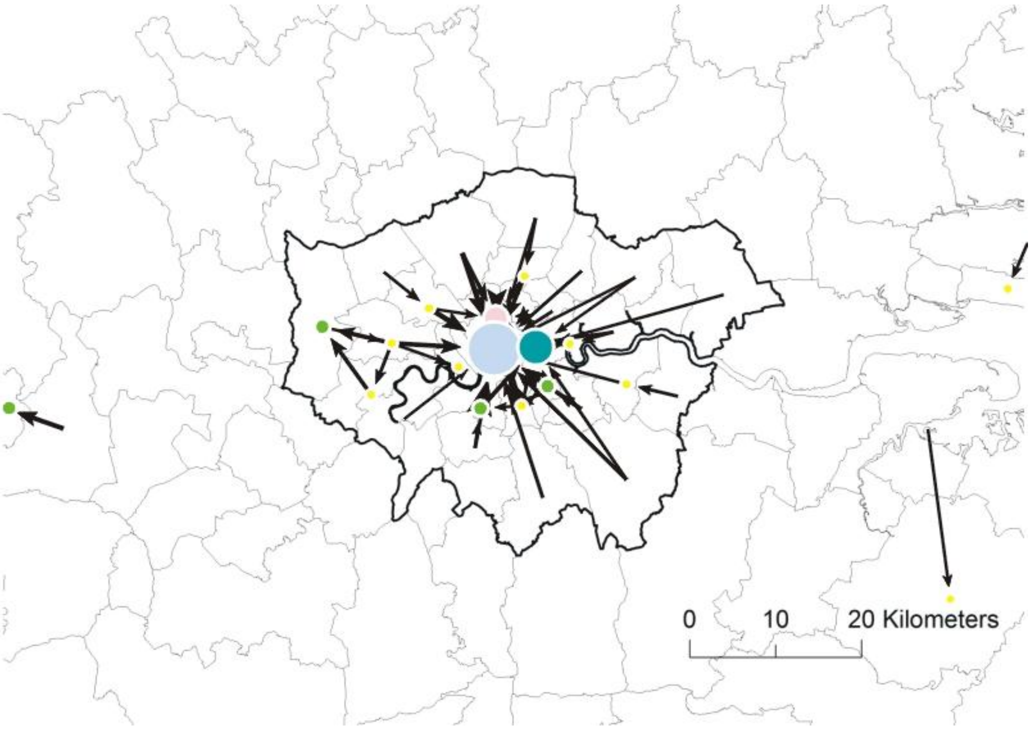

Figure 12 Commuting pattern and centrality by local authority in London (over 8000 trip)

The three maps of the commuting pattern organised by threshold in London confirms the initial assumption that London is a monocentric city. The majority of commuting in the region is directed towards the central area of London. In central London, there are three prominent Borough destinations of commuting: Westminster (00BK); City of London (00AA); and Camden (00AG). Although they appear to be separate areas as they belong to different boroughs, the actual employment centres adjoin each other. In this sense, they can be assumed to be a cluster of employment. Hereafter these areas will be regarded as a cluster of employment centres of the Central Activities Zone (CAZ) as Greater London Authority (GLA) identifies[59]. The commuting inflow to them comes from all sides. In the peripheral area of Greater London, Hillingdon, Barnet, and Ealing are prominent destinations. Despite of the considerable inflows to these destinations from nearby boroughs, it is not relevant to regard these as entirely independent residential spheres. It is because these areas are closely connected to the commuting hierarchy to London as there are considerable numbers of commutes from these areas to central London.[60] In the outer area beyond Greater London, Welwyn (26UL), Basildon (22UB), Southend on Sea (00KF), Dartford (29UD), Tonbridge (29UP), Maidstone (29UH), Crawley (45UE), Windsor (00ME), and Reading (00MC) have prominent inflow commuting from all directions.[61] It is reasonable to consider that they are independent residential areas from central London as they are fairly remote from the city, being more than 30km from central London.

Commuting towards the CAZ of Westminster, City of London, and Camden is from all directions whereas commuting towards other local authorities in Greater London is limited in the direction of the origins from which they draw. This implies that the CAZ are dominant centres and the others in Greater London are sub-centres within one merged residential sphere. For example, a local authority in a peripheral area to Greater London, Enfield (00AK), provides commuters to inner local authorities of Haringey (00AP), Islington (00AU), and the CAZ. An inner area of Haringey has commuters to Islington, and the CAZ. However, it also has commuters from Enfield. The more central area of Islington has commuters to the CAZ. However, it also has inflow commuters from Haringey. This implies that in one merged residential sphere, Enfield lies in the bottom of hierarchy, Haringey is in the middle above

[59] GLA, 2004

[60] For further details about the relationship between directions of commuting and independence of residential sphere, see the previous section 4-2-3.

[61] These centres of inflow commuting are exactly consistent with the centres of employment in terms of employment density (jobs per km^2). The employment density map in London and nearby South East made by Buck et al. (2002) is helpful to understand general structure of distribution of employment in the region.

Enfield, Islington is in the upper middle above both Enfield and Haringey, and the CAZ from the top level.

5-3 Embodiment of house price

Understanding the shape of a housing market in terms of house prices is a crucial process in spatial analysis of a city. It not only enables an overview of the basic structure of house prices of a city but also gives important information on spatial housing submarkets in the city. The average house price in London varies between boroughs (Table 4). The average house prices tend to be higher in central areas and lower in outer areas. In this section, the house prices in London are embodied in more detailed and readable shapes.

Table 4 Average house price in London by Borough

Average house price	Boroughs
Under £100,000	Barking and Dagenham, Newham
£100,000 – £149,999	Bexley, Croydon, Enfield, Greenwich, Havering, Hillingdon, Lewisham, Redbridge, Sutton
£150,000 – £199,999	Brent, Bromley, Ealing, Hackney, Haringey, Harrow, Hounslow, Kingston, Lambeth, Merton, Southwark, Waltham Forest
£200,000 – £249,999	Barnet, Islington, Tower Hamlets, Wandsworth
£250,000 – £299,999	City of London, Hammersmith and Fulham, Richmond
Over £300,000	Westminster, Kensington and Chelsea

Source: HM Land Registry; Bowie (2010)

5-3-1 Data & range of analysis

The house price data was collected by sampling for London. By post code districts in and surrounding Greater London, a total of 315 samples for 3 bedrooms house and 317 samples for 2 bedrooms flat has been collected. For the time series analysis, price data was collected in the 9 year period from 2000 to 2009[62]. Rent data was collected for 2009 only, due to data availability. House rent and asking prices have been most recently updated in March 2009.

The detailed method of data collection is as follows. First of all, the geographical range of the study area was set including Greater London (post code area of EC, WC, N, E, SE, SW, W, and NW) and surrounding areas (Enfield (EN), Ilford (IG), Romford (RM), Dartford (DA), Bromley (BR), Croydon (CR), Sutton (SM), Kingston upon Thames (KT), Twickenham (TW), Uxbridge (UB), Harrow (HA), Watford (WD), St Albans (AL), Chelmsford (CM), Tonbridge (TN), Slough (SL), Hemel Hempstead (HP), Guildford (GU)). Secondly, one sample house and one sample flat by each post code district are then surveyed. One of the most widely used real estate websites in the UK, 'www.findaproperty.com' is used for collecting price and rental data. The median house price and house rent within each post code district was selected in order to control the problem of extreme values. Thirdly, from the same website, the structural data of properties, including the number of bedrooms, the number of bathrooms, the number of reception rooms, floor area, tenure type, house type, and addresses, were collected. Fourthly, the data of post code and past transaction prices were collected from the website, 'www.houseprices.com', where official data from HM Land Registry is shared. Fifthly, the location data, defined by longitude and latitude was collected using a GIS web programme, 'Google Earth', using the post code data. Finally, the data measuring accessibility to the centre of employment was constructed using the location data. Physical distances between each sample house and flat to the centre of employment 'Green Park' tube station were constructed first.[63] The commuting time by public transport to the centre from each sample house and flat were also constructed using 'Journey Planner' programme in Transport for London webpage.[64]

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[62] The house price data of 2009 is asking price data of all sample properties. But the house price data from 2000 to 2008 is based on the past sold prices of houses which have same structural features in the same post code district to each sample property. For detailed house price data see appendix 5-2.

[63] For the details of the setting centroid of London, see section 5-5-1.

[64] More detailed process of data construction can be found in section 5-5-1.

5-3-2 2-D contours & 3-D surfaces of house price

2-dimensional contours and 3-dimensional surfaces of house prices could be visually embodied with the help of a GIS programme, 'Surfer'[65]. 3 data sets of X (longitude), Y (latitude), and price[66] of each 315 houses and 317 flats were input to the programme to generate the embodiment of house price in the whole housing market. For the XY data to fit in the programme, longitude and latitude data were transformed to plain metre based unit.[67]

The following figures are the result from this analysis. They show the location of sample houses, 2-D contours, and 3-D surfaces of house and flat prices over 10 years in London. The general shapes of London's house price show one mountain-like cone. There is one dominant peak around West End which lies in the centre of the entire area. Except for a small peak around Twickenham there is no prominent peak in London. Only local peaks such as Hillingdon, Slough, Watford, Epping, and Sevenoaks in the peripheral area of Greater London exist. Virginia Water and the Egham area consist of an independent peak. The shapes of flat price show more local peaks than those of house price. However, the basic structures, with one dominant peak in central London, are generally the same as those of house price.

From this result, it can be deduced that there is one merged residential sphere, in the sense defined in the section 4-1, in Greater London and other centres of employment are merged by and become subordinate parts of it. There is slight chance that Twickenham remains a residential sphere which is not yet fully merged. However, Twickenham cannot be seen as an independent residential sphere according to the commuting pattern of London. The reason of prominent house price in Twickenham is more to do with other factors, such as well-connected modes of transportation to the central London, educational and environmental superiority. The boundary of the merged cone is around 30km from the central peak. Beyond this boundary, other employment centres, such as Reading, become the dominant determinations of rent.

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65 This programme estimates values in unobserved locations using neighbouring observed data and creates contour and 3-D surface maps.

66 Unit of price are unified to 10 dollars per m^2 to 1) control variance of floor area and 2) compare it with other international figures. Exchange rate of 2 \$/£ is applied for the currency conversion over all period.

67 As latitude of London is around 51.5, 1 degree of latitude is assumed to be 111.26 km and 1 degree of longitude is assumed to be 74.2 km

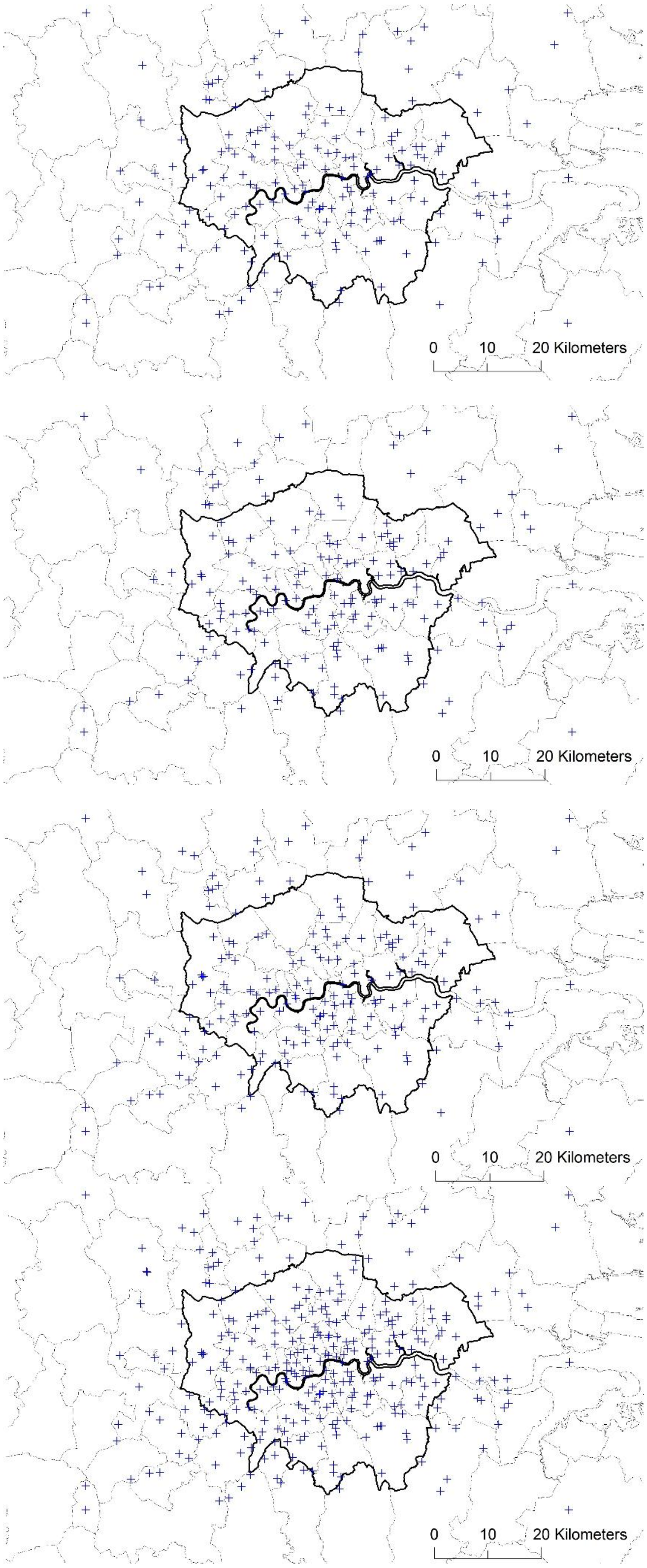

Figure 13 Location of samples houses in London

(2000, 2003, 2006, and 2009 from the top)

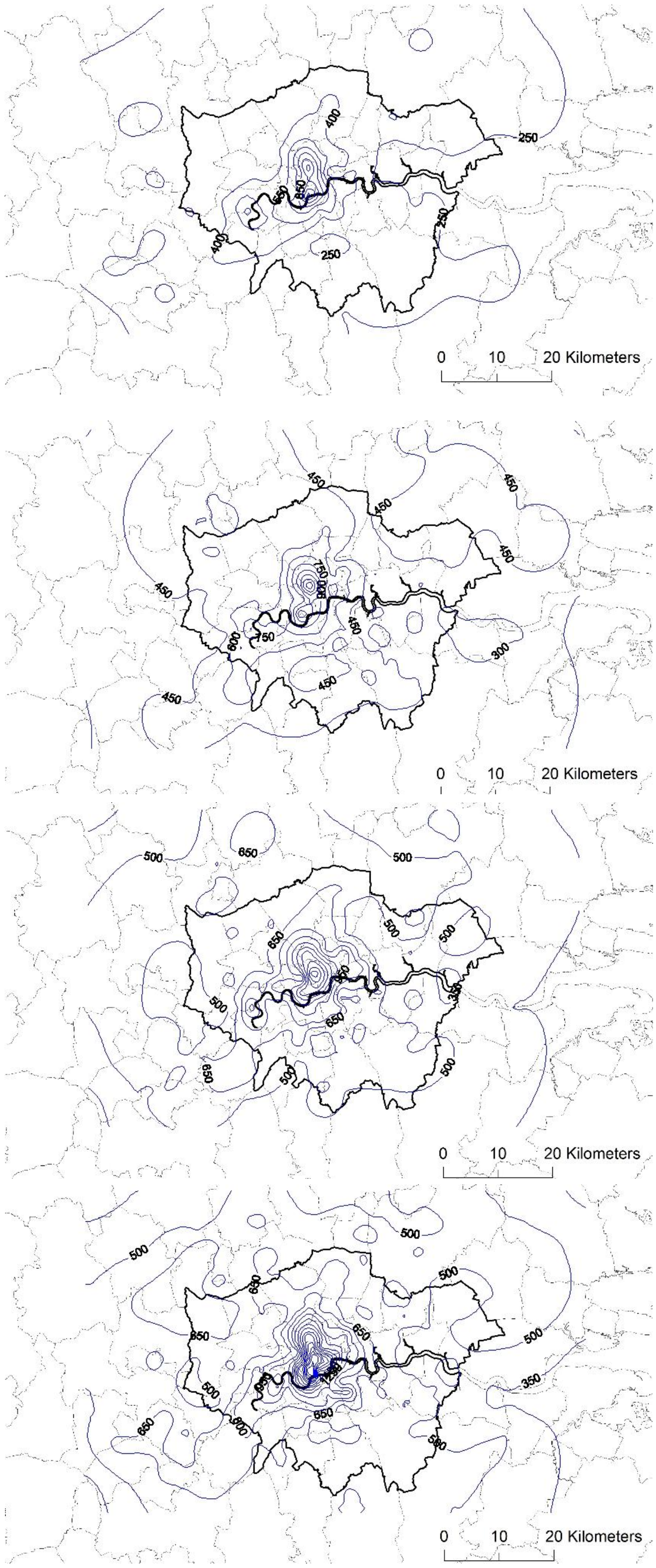

Figure 14 2D contours of house prices in London (10 $\$/m^2$)(2000, 2003, 2006, and 2009 from the top)

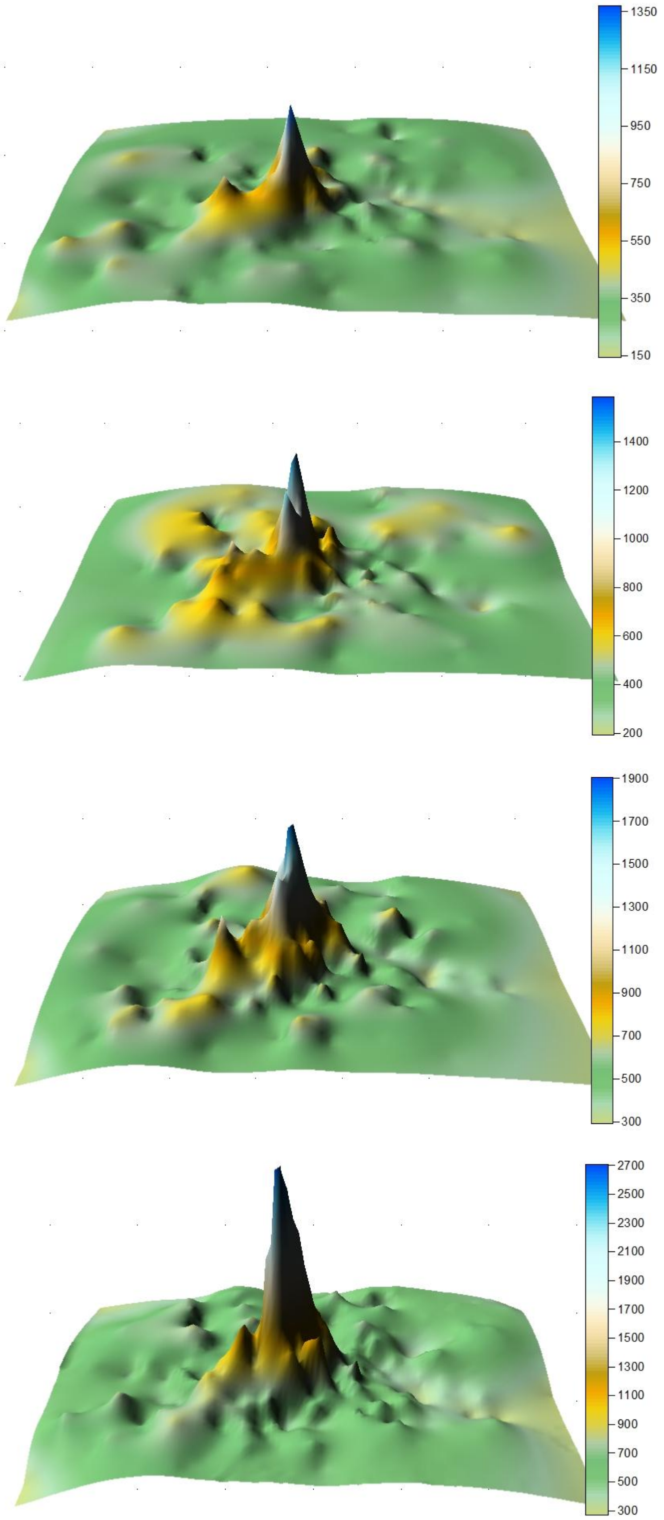

Figure 15 3D shapes of house prices in London (10 $/m^2)

(2000, 2003, 2006, and 2009 from the top)

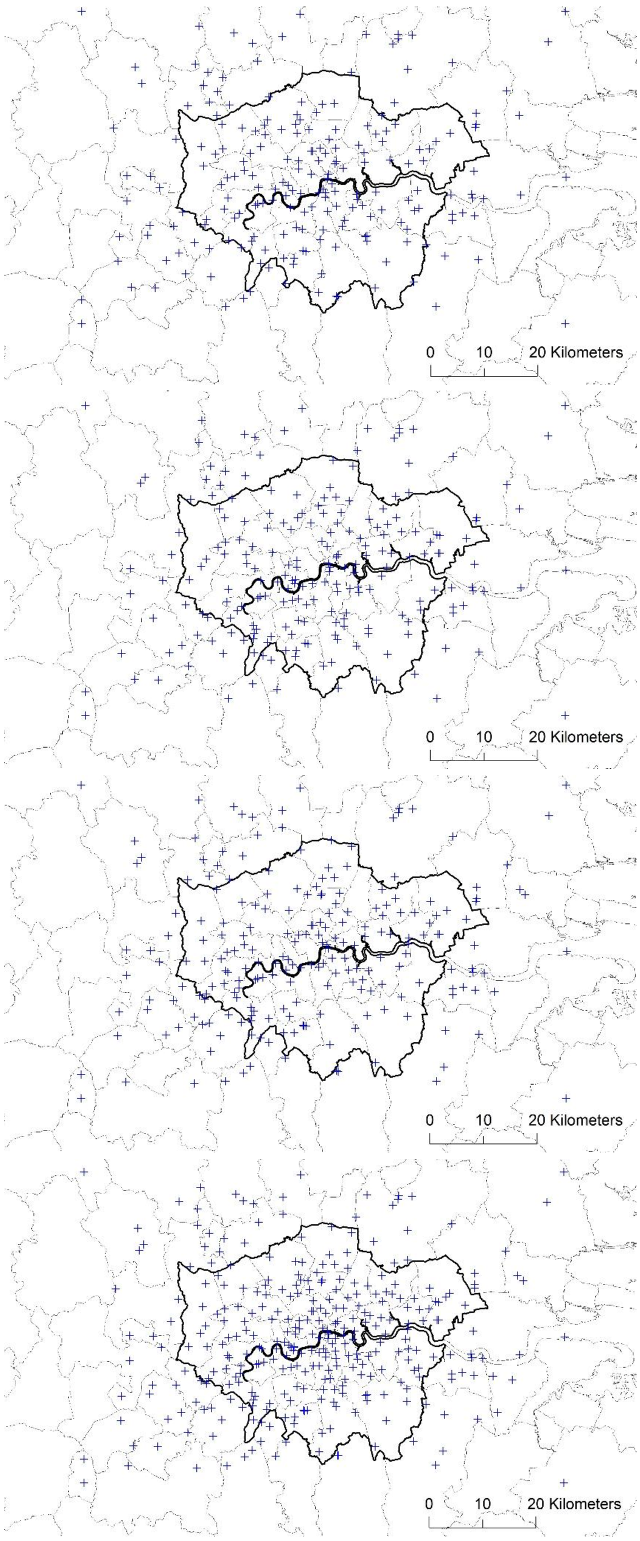

Figure 16 Location of samples flats in London

(2000, 2003, 2006, and 2009 from the top)

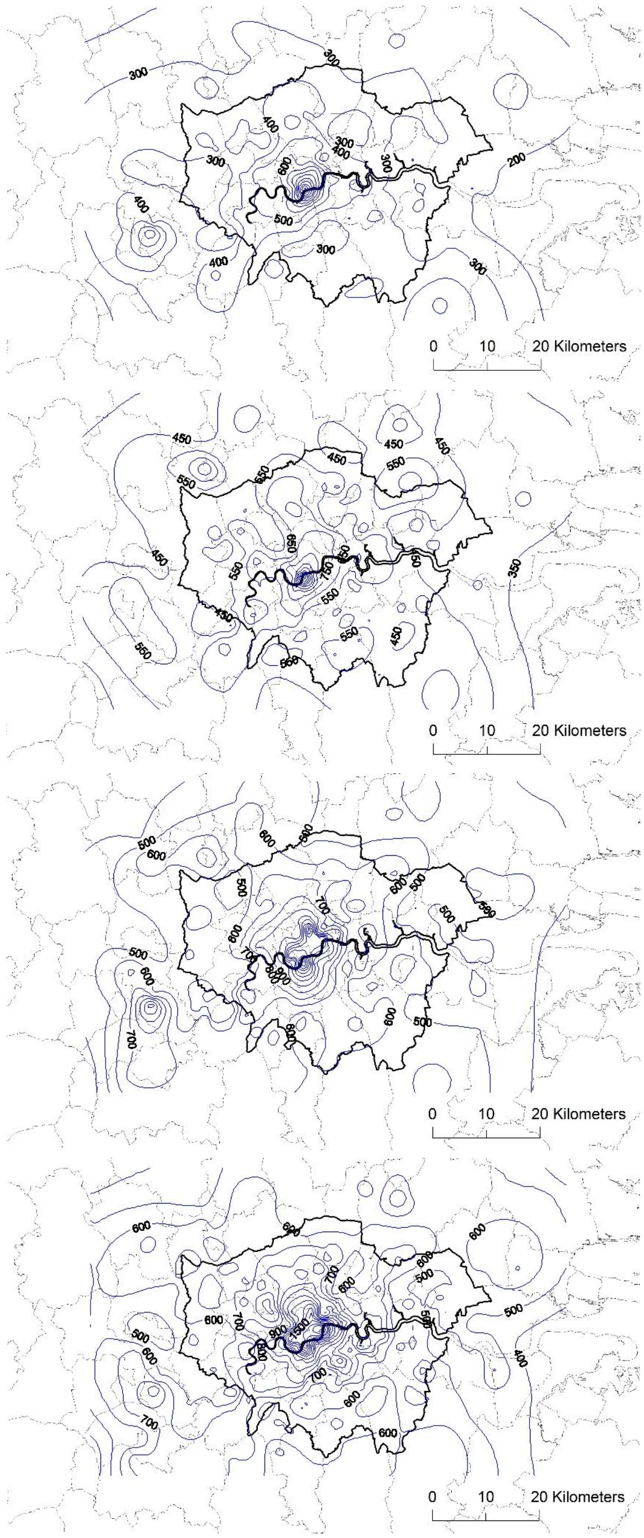

Figure 17 2D contours of flat prices in London (10 $/m^2)

(2000, 2003, 2006, and 2009 from the top)

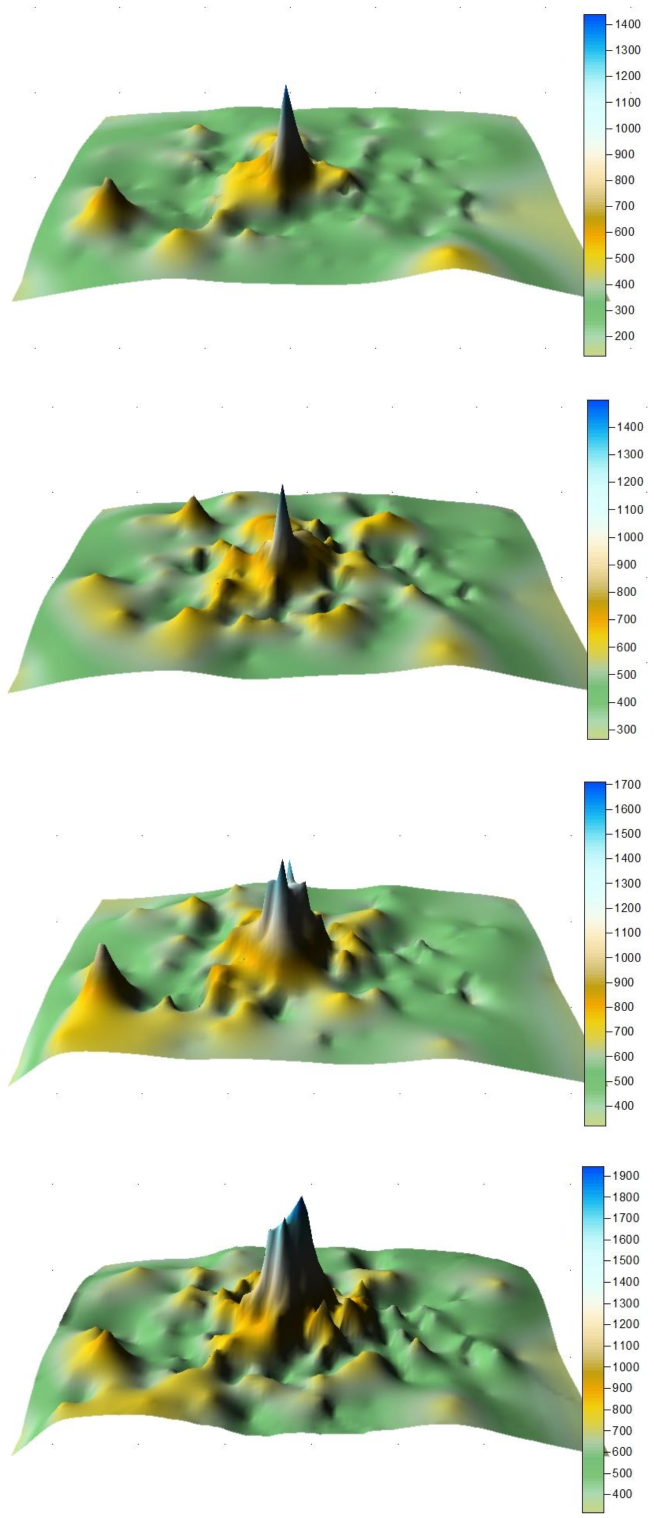

Figure 18 3D shapes of flat prices in London (10 \$/m^2)

(2000, 2003, 2006, and 2009 from the top)

5-4 Subdivision of the housing market

Figure 19 Major spatial housing submarket in London

It has been identified that the commuting pattern flows towards one central point of London. This implies that London has only one spatial housing submarket. The fact that the 2-D contours and 3-D surface cones of house and flat price in London form only one dominant peak also verifies the structure of the spatial housing submarket in London. Although there are three main centres of commuting inflow of Westminster, Camden, and the City of London, the spatial housing submarket of London appears to be singular. It can be explained by supposing that the three dominant residential spheres surrounding the three centres merged together into one, due to their relative proximity to one another. It is appropriate to regard the three centres as one cluster of employment in this status. The geographical boundary of the spatial housing submarket of London is around 30km in terms of physical distance and 90mins in terms of total commuting time including waiting time from the centre of London[68].

In the following analysis, London can thus validly be treated as one spatial housing submarket in itself. In terms of the sectoral housing submarkets, two sectoral housing

[68] The location of the central point of London and data of commuting time will be discussed in the following section; gradient of house and flat price become even in the outer area of around 30 km radius boundary or 90 mins commuting time.

submarkets, of 3 bedroom houses and 2 bedroom flats, will be the subject of the following analysis.

5-5 The spatial structure of the housing market

Based on the subdivision of the spatial housing submarket in the previous section, this section will investigate the contribution of accessibility to employment centres to house prices in a spatial housing submarket and its changes, along with the general level of house prices by time period. Throughout this section, the implication of differential rent and absolute rent as fundamental components of land rents in the residential space will be examined with their dynamic features.

5-5-1 Data & range of analysis

The first step for the analysis on the spatial structure of house price in a city is to set the location of the main employment centre of the city. In London, this thesis has identified three major centres of commuting inflow of Westminster, Camden, and the City. Among the three main centres of commuting inflow to London, Westminster is the most dominant commuting centre; Westminster is the destination for 496,991commuting trips, compared to 307,197 for City of London, and 222,938 for Camden. As Westminster itself is a broad area covering more than 20 km^2, a further origin-destination analysis is needed to set a proper geographical centre of Westminster as the centre of employment in London. For this, the origin-destination data from all council areas of Greater London, East, and South East to the 20 electoral wards within Westminster was analysed. 20 electoral wards in Westminster are Abbey Road, Bayswater, Bryanston and Dorset Square, Church Street, Churchill, Harrow Road, Hyde Park, Knightsbridge and Belgravia, Lancaster Gate, Little Venice, Maida Vale, Marylebone High Street, Queen's Park, Regent's Park, Saint James's, Tachbrook, Vincent Square, Warwick, West End, Westbourne. Among the wards in Westminster borough, St. James's and West End are detected as the most frequently commuted centres, as St. James is the destination for 178,846 commuting trips and West End for 145,617 while others are the destinations for fewer than 25,000 except for Marylebone High Street, which is the destination for 48,623. As the border of the two wards is Piccadilly from Hyde Park Corner to Piccadilly Circus, based on the commuting data, the following analysis will assume Green Park tube station as the centre of the employment centre in London as it is in the centre of the border road between the two wards. The location of Green Park tube station is [51°30´25´´ N, 0°08´35´´ W] in degrees[69].

Several measures reflecting differences of accessibility to the centre of employment were collected, including physical linear distance, net transportation time, waiting time, and the number of changes of modes of transport during commuting. The physical linear distance from each location of property to Green Park station was constructed by using the method of calculating distances between two points of coordinates. The data of net transportation time, waiting time, and the number of changes was collected as a measure of commuting costs. As public transportation is the main mode of transportation for commuting in London, a web-based journey planning programme on public transport, 'Journey Planner' in the official Transport for London was used. [70] In each set of data, the destination was set to Green Park station.

The measures of net commuting time, waiting time and the number of changes are collected on the basis of the median value. The median commuting time to Green Park station was set using the arrival time of at 9a.m. on 16 September 2009. The commuting time data of 261 out of 315 sample houses and 256 out of 317 flats could be constructed from the web programme, as commuting using public transportation from properties in the outer area of Greater London is difficult or impossible and therefore could not be constructed using the programme.

The unit of price of house and flat are unified to 10 dollars per m^2 to control the variance of floor area and to be comparable to other international figures. The exchange rate of two US dollars to the pound sterling is applied for the currency conversion over all periods. The unit of physical distance is set to km and the unit of commuting time is set to minutes.

5-5-2 Regression analysis of house price on accessibility by submarket

A simple OLS regression analysis of price of house and flat on accessibility has been conducted in this section. Using this process, the contribution of accessibility to the centre of

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[69] In order to transform the geographic coordinate system to linear units of metres, the length of 1 degree of latitude is assumed to be 111.26 km and the length of 1 degree of longitude is assumed to be 74.2 km when the latitude of coordinates is in the range of around 51.5 degrees. This means that the location of Green Park station is [10.615 km W, 56.4 km N], where 0 degree of longitude is the base line of x coordinates and 51 degrees of latitude is the base line of y coordinates.

[70] www.tfl.gov.uk

London to house and flat price can be examined. In addition, the coefficients of gradients and constants can be applied to analyse the structure of land rents in an urban context. Regression analysis has been conducted on independent variables of physical distance and total commuting time respectively. The first regression analysis was on house price on accessibility variables. Scatter plots, regression fit lines, and 95% confidence intervals are on the following diagrams. The statistical results from the regression analysis of R^2, coefficients, t-values, and 5^{th} percentiles[71] are summarised in the table 5.

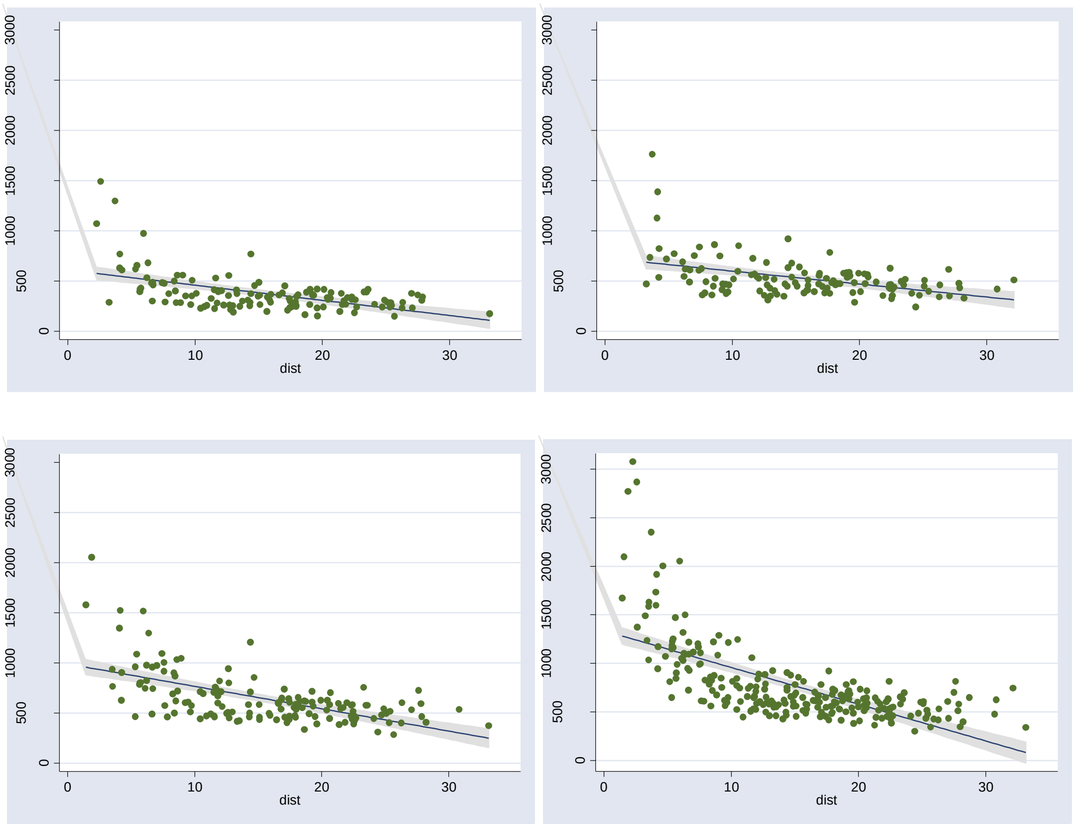

Figure 20 Scatter plot of house price on distance to employment centre in London

(2000 top left, 2003 top right, 2006 bottom left, 2009 bottom right)

[71] This study uses 5^{th} percentile as the minimum level of house prices and rents. To control the extreme cases in the smallest value, 5^{th} percentiles assuming normal distribution are chosen as the value for the minimum.

Some clear observations can be made from the diagrams. Firstly, house prices and physical distance from the centre of employment show the expected negative correlation throughout the periods. Secondly, the gradients of the fitting line get steeper over time. Thirdly, a few extremely expensive samples close to the centre increase variance in the regression fit as a whole and this is aggravated over time. These features are also observed the same in the result of the regression analysis of house prices on commuting time instead of physical distance.

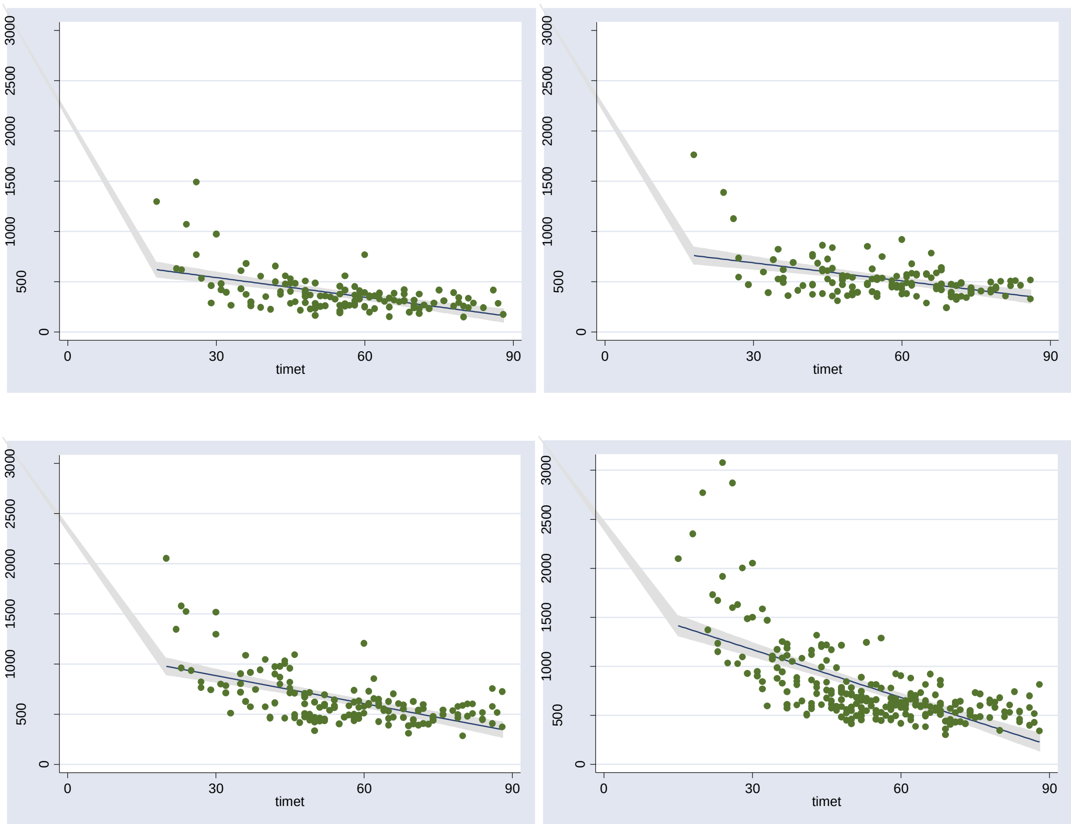

Figure 21 **Scatter plot of house price on commuting time to employment centre in London**

(2000 top left, 2003 top right, 2006 bottom left, 2009 bottom right)

A simple regression analysis of house price on the accessibility to the centre of employment across housing submarkets over time shows some characteristic points.

Firstly, results from the regression analysis show similar patterns for both the distance variable and the commuting time variable. In both analyses, the explanatory power of the analysis has dropped from about 30% to 20% from 2000 to 2003. However, it has been improved in the following periods reaching up to more than 40%. Nevertheless, the explanatory power of the commuting time variable is slightly greater than the variable of physical distance. The possible reason for this will be discussed with the result of analysis with the flat data.

Second, the coefficients of accessibility and the constants have increased over time. They are all statistically significant at 0.1%. The increases in coefficients have been accelerated over time.

Third, the 5th percentiles of house price have also increased during the periods. The change from year 2000 to year 2003 is especially noticeable.

Table 5 OLS Regression of house price on distance / commuting time to employment centre in London

	Year	Sample size	R^2	Coefficient of accessibility	Constant	5th percentile*
Distance	2000	129	0.2844	-15.1 (-7.10)	610 (17.02)	195
	2003	129	0.1999	-12.9 (-5.63)	728 (18.62)	344
	2006	147	0.3584	-22.3 (-9.00)	990 (23.58)	396
	2009	242	0.4290	-37.8 (-13.43)	1335 (28.66)	418
Commuting time	2000	129	0.2882	-6.5 (-7.17)	736 (14.11)	195
	2003	129	0.2184	-6.0 (-5.96)	868 (14.61)	344
	2006	147	0.3476	-9.3 (-8.79)	1162 (18.96)	396
	2009	242	0.4309	-16.2 (-13.48)	1659 (24.10)	418

Notes: Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5th percentiles are based on normal distribution

The following diagrams and table are the result of regression analysis of the price of flats on the accessibility variables of physical distance and commuting time. The values of scatter plot, regression fit lines, and 95% confidence intervals are on the following diagrams. The statistical results from regression of R^2, coefficients, t-values, and 5th percentiles are shown in the table 6.

In general, results from the regression analysis of price of flat on accessibility variables show similar characteristics from those of house price. Firstly, the expected negative correlation between price of flat and the physical distance from the centre of employment has also been identified throughout the periods. Secondly, the gradients of the fitting line get steeper over time as well. Thirdly, few extremely expensive samples close to the centre increase variance in the regression fit as a whole. The observations from the regression of price of flat on commuting time show similar features.

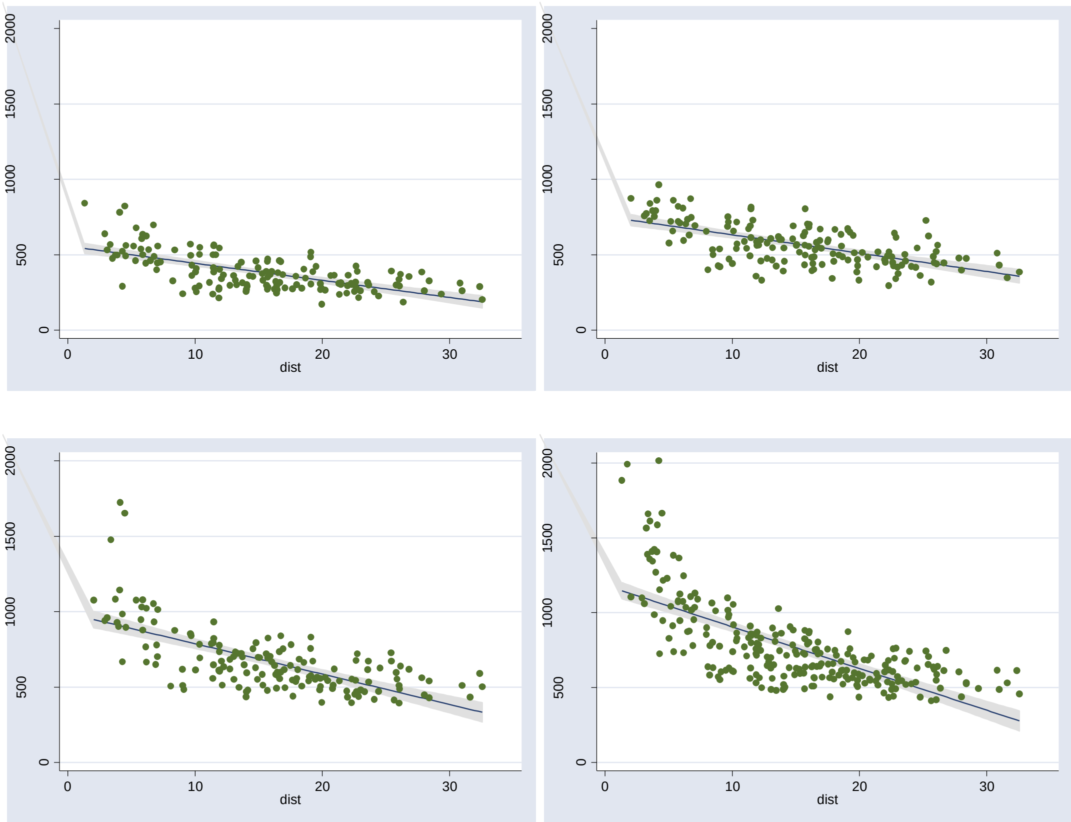

Figure 22 Scatter plot of flat price on distance to employment centre in London

(2000 top left, 2003 top right, 2006 bottom left, 2009 bottom right)

The simple regression analysis of price of flat on the physical distance to the centre of employment across housing submarkets over time shows some characteristics.

First, the commuting time variable shows more significance than the physical distance of around 5% points in terms of explanatory power. There are many properties whose location has greater accessibility in terms of transportation so less commuting cost even though the physical distance is far away from the centre of employment. For example, properties around Surbiton station in zone 6 can have similar commuting time as those around Wimbledon in zone 3 which locates nearer than Surbiton to the central area because there are frequent express trains from Surbiton to Waterloo station in central area which takes even less than from Wimbledon to

Waterloo. This kind of improved transportation infrastructure makes South Western area of London more expensive than closer areas to central London such as Ealing, Harringay, and Lewisham.

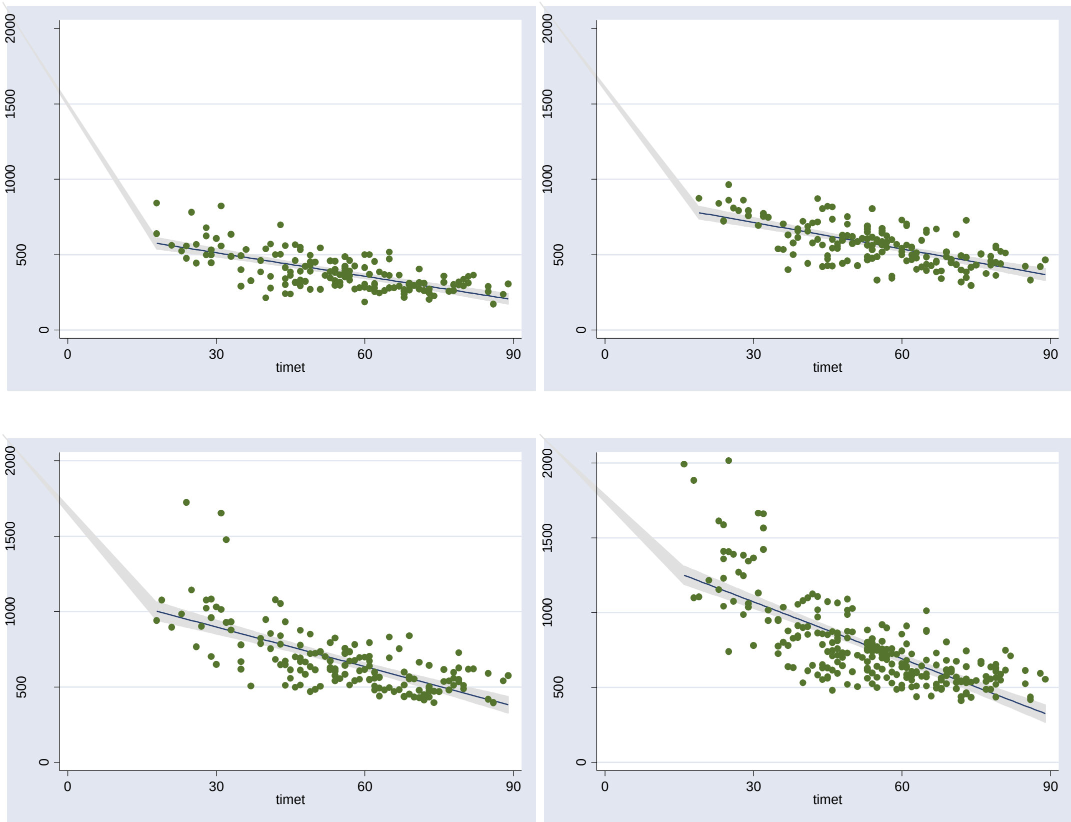

Figure 23 Scatter plot of flat price on commuting time to employment centre in London (2000 top left, 2003 top right, 2006 bottom left, 2009 bottom right)

Second, the difference of explanatory power of the commuting time variable over the physical distance variable in the flat submarket is greater than that in the house submarket. The difference in the flat submarket is around 4% points whereas it is less than 1% points. This can be explained by the fact that flats are located more closely to stations than houses.

Third, explanatory power of the analysis shows greater figures than that of the analysis of house price. Accessibility variables explain around 45% of the variation of flat price in London. This difference of more than 10% explanatory power of the accessibility between house and flat can be explained in two ways. One possible reason is that the housing submarket of 2 bedroom flat is more influenced by commuting factors than house. The reason why the gap between the physical distance and the real commuting time is greater in housing submarket of flat is in the same context with this significance of commuting in the market. The other possible reason is that there are wider variances in the data of sectoral housing submarket of 3 bedroom house. The samples of 3 bedroom house fall into two sub-types of semi-detached house and terraced house. This existence of the two slightly different types in the data would increase the variance in price of house resulting in lower explanatory power. In addition to this, the sectoral housing submarket of house has other factors which increase variance in price such as the size of back garden, conservatory, and garage. In general, the narrower a sectoral housing submarket is, the more significant the contribution of accessibility will be.

Table 6 OLS Regression of flat price on distance / commuting time to employment centre in London

	Year	Sample size	R^2	Coefficient of accessibility	Constant	5^{th} percentile*
Distance	2000	150	0.4183	-11.3 (-10.32)	556 (30.20)	237
	2003	157	0.3831	-12.2 (-9.81)	753 (35.76)	355
	2006	159	0.4465	-20.1 (-11.25)	989 (31.89)	433
	2009	245	0.4958	-27.8 (-15.46)	1184 (39.86)	487
Commuting time	2000	150	0.4555	-5.2 (-11.13)	668 (25.13)	237
	2003	157	0.4311	-5.9 (-10.84)	890 (28.62)	355
	2006	159	0.4649	-8.7 (-11.68)	1160 (26.53)	433
	2009	245	0.5371	-12.7 (-16.79)	1452 (34.21)	487

Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5^{th} percentiles are based on normal distribution

Fourth, the coefficients of accessibility and constant have increased over time. They are all statistically significant at 0.1%. Although it is difficult to directly compare the coefficients of distance and commuting time as they have different units, both have almost tripled over 10 years.

Fifth, the 5^{th} percentiles of house price have also increased during these periods. It has almost doubled over 10 years from 2370 dollar per m^2 to 4870 dollar per m^2.

These characteristics of changes can be interpreted with the understanding of the dynamic changes of land rents in the following section.

5-5-3 Dynamic changes of differential rent & absolute rent

The coefficients of the regression analysis can be used to figure out the dynamic changes of land rents in housing market. Firstly, the coefficients of accessibility can be understood as the contribution of differential rent to the variance of house and flat price. Secondly, the constants can be understood as the heights of the base of the cone of house and flat price. Thirdly, the 5th percentiles[72] can be regarded as the minimum level of house and flat price in a given time in a certain sectoral housing submarket, which reflects the level of absolute rent in each sectoral housing submarket. The boundary of a spatial housing submarket then can be deduced from the combined use of coefficients of accessibility to the centre of employment, constants and the 5th percentiles of house price.[73]

Based on these data of coefficients and 5th percentiles, the structure of price of housing market in London over time has been drawn. Residuals from sampling, extreme values, and other various factors affecting actual contracts of transactions of house are all making it difficult to find the underlying trend of price of house. Moreover, there are many factors affecting house price such as the construction cost and the speculative expectation on future price other than capitalised land rents. The substitution effect between house buying and renting also makes it difficult to simply regard house price as a capitalised rent. Nevertheless, the lines of house price by housing submarket over time in the following diagrams can be a starting point for the proper analysis to reveal the structure and dynamic movements of land rents in urban area. For the simple terminology, accessibility variance in house price which is mainly contributed by differential rent will be called DR proxy and the 5th percentile of house price which is mainly contributed by absolute rent will be called AR proxy hereafter.

The following two diagrams show changes in DR and AR proxies over time by sectoral housing submarkets of 3 bedroom house and 2 bedroom flat in London. These diagrams of changes of house prices over time imply various points.

Firstly, it can be seen that the gradients of DR proxies in both sectoral housing submarkets of houses and flats get steeper over time. Although the changes of gradients from 2000 to 2003 are not significant, the changes from 2003 to 2006 and from 2006 to 2009 get more significant. As DR reflects the advantage inherent in living closer to the centre of employment, this pattern

[72] See footnote 71.
[73] The point where the slope from the y intercept meets the 5th percentile line can be understood as the geographical boundary of a spatial housing submarket.

of changes can be interpreted to show that the costs of commuting have been increased or that the benefits to be gained from living closer to the central area has increased or both. For the same period, the international price of crude oil and the price of UK retail fuel have started to significantly increase from year 2002.[74] In addition, the congestion charge scheme[75] was introduced in 2003. These facts may explain the steepening changes of DR proxies in house and flat prices in London over the periods.

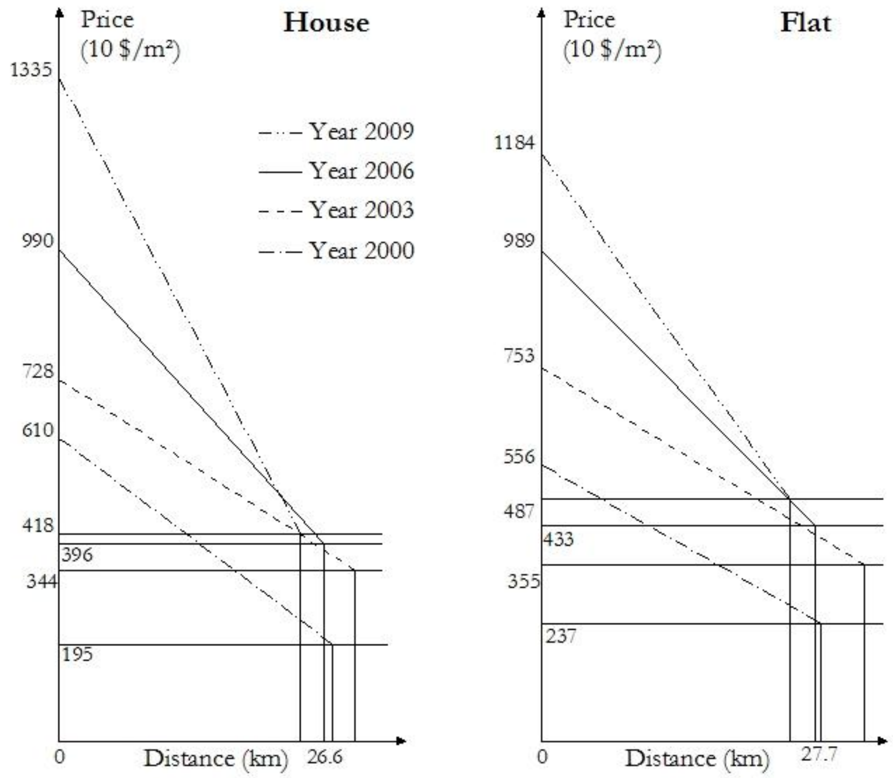

Figure 24 Changes of DR and AR proxies of property prices in London

Secondly, the levels of AR proxies have increased throughout the period regardless of sectoral housing submarkets. They have more than doubled over the 10 year period. The increase from year 2000 to year 2003 is especially significant. The AR proxies of house and flat have increased by 76% and 50%, respectively, in the period. They have increased in the successive periods with reduced but still substantial rates. This implies that the growth in

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74 Source: IMF, 'monthly primary commodity prices'; Department of Energy and Climate Change, 'Premium unleaded petrol and diesel prices in the EU'

75 See footnote 50.

demand chronically exceeds the supply of housing in both sectoral housing submarkets.[76] This mismatch of demand and supply in housing market in London has been widely recognised.[77]

Table 7 Changes of AR proxies of property price in London

Year	3 bedroom house		2 bedroom flat	
	AR proxy	change	AR proxy	change
2000	195		237	
2003	344	+ 76 %	355	+ 50 %
2006	396	+ 15 %	433	+ 22 %
2009	418	+ 6 %	487	+ 12 %

Thirdly, the pattern of movement of DR and AR proxies from 2000 to 2003 is different to that pattern after 2003. The shift of DR and AR proxies upwards with small changes in gradients from 2000 to 2003 is likely to have been caused by 1) the increase in AR proxy and 2) the spatial expansion of housing submarkets. On the other hand, the changes since 2003 are mainly led by the increase in DR proxy which implies that there has been a steady increase in the advantage to be gained from living closer to the central area.

Fourthly, the pressure for development force varies by sectoral housing submarkets and locations. The AR proxies of both sectoral housing submarkets have changed together in similar patterns. However, the AR proxy for flats is slightly greater than that for houses in all time sections, which implies the preference for flats has grown faster than that for houses in London. In general, therefore, it can be construed that the incentive for development for the sectoral housing submarket of 2 bedroom flats is greater than for that of the 3 bedroom houses in London if other conditions are equal. On top of this, considering the higher density of land usage of flats in terms of floor area ratio, the pressure for redevelopment to build flats in London is far greater than the pressure to build houses. This is in the same context as the current prevailing conversion of houses to maisonette flats in London. In addition to this, central areas have experienced a greater and increasing pressure for redevelopment compared to outer areas, as DR proxies have increased over time.

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76 As house prices reflect speculation as well as real demand, a comparative approach using price data with rental data can provide more significant implication. This comparative analysis was conducted in Seoul's housing market in the section 6-5-3.

77 See Barker (2003, 2004), ODPM (2005a), DCLG (2006)

5-6 Conclusion

This chapter investigated the structure of housing market in London. Firstly, the spatial and sectoral housing submarkets in London were identified based on the analysis of housing submarkets in chapter 4. 3 bedroom houses and 2 bedroom flats were selected as two representative sectoral housing submarkets in London. The identification of spatial housing submarkets is based on two analyses: the mapping of commuting patterns and the embodiment of 2-D contours and 3-D surface cones of house price. The results of the two analyses showed that London consists of one merged spatial housing submarket in itself.

Secondly, regression analysis was conducted to find out the contribution of accessibility to the centre of employment to house prices and the structure of land rents in housing market. The variable of accessibility to the centre and house prices shows a negative relationship in consistency with the traditional theoretical concept of land rent. Both of the accessibility variables of physical distance and commuting time show a similar level of explanatory power in each sectoral housing submarket. The variance in accessibility explains around 32% of the variance in price of houses and around 45% of the price of flats in London.

Thirdly, the coefficients from the regression analysis were used to construct a diagrammatic model of the structure of house prices. The changes in DR and AR proxies over 10 years from 2000 to 2009 suggest that there has been a significant increase in commuting cost and a growing imbalance between demand and supply of housing in the two sectoral housing submarkets. In addition, two different patterns of changes in DR and AR proxies over time were observed. One is the increase in AR along with expansion of the spatial housing submarket, and the other is the independent increase in DR. The changes in DR and AR proxies also reveal that profitability of development of residential properties may vary between sectoral housing submarkets and locations of properties.

In spite of the limits of analysis from sampling, an alternative use of price data for land rent, and the imperfectness of regression fit, there are some unique and positive contributions in this empirical study. Firstly, the combined use of mapping commuting patterns and the embodiment of the shape of house price can be suggested as a useful solution to the complicated problem of subdivision of spatial housing submarkets. Secondly, the method of diagrammatic modelling based on the regression analysis of house price can be a useful tool for investigating the structure and dynamic movements of land rents in an urban area.

Chapter 6.

Spatial analysis of the housing market in Seoul

6-1 Introduction

Seoul is the capital of South Korea. The administrative area of Seoul covered 605 km^2 and accommodated around 10,300,000 people in 2003, making its population density 17,200 people per km^2.[78] In terms of effective commuting, the boundary of Seoul extends to neighbouring cities including SeongNam, UiJeongBu, AnYang, BuCheon, GwangMyung, GoYang, GwaCheon, GuRi, NamYangJu, SiHeung, GunPo, UiWang, HaNam, GwangJu, and GimPo. This metropolitan area of Seoul contained more than 16,000,000 people and covered around 2,500 km^2. Hereafter 'Seoul' refers to the Seoul metropolitan area covering the effective commuting area. Seoul is a multi-centre city which has 3 major employment cores. The main modes of transportation in Seoul are underground and train (34.6%), private car (26.9%), and bus (26.0%) in 2002.[79] The three main housing types in Seoul are apartment (54%), detached house (20%), and multi-family flat (18%) in 2005.[80] There are two main types of tenure of dwelling stock in Seoul. In 2000, 66% of dwelling stock is owner-occupied houses and 26% of it is 'Jeonse'[81] letting.

6-2 Commuting patterns and centrality

A commuting pattern can show the relationship between the centres of employment in a city in the most direct way. Having argued that residential sphere consists of a centre of employment and the surrounding residential area, the directions of commuting between sub-centres in merged residential spheres can reveal the hierarchical relationships between them. Based on the commuting pattern, spatial housing submarkets can be identified.

[78] Source: the National Statistical Office of Korea
[79] Transportation bureau, Seoul Metropolitan Government
[80] Source: the National Statistical Office of Korea
[81] 'Jeonse' is a unique type of rent payment in Korea. It is a lump sum of deposit, which is normally worth about 20 times the value of monthly rent. Paying a long term deposit for a year or two years without monthly rent payment is the basic contract of 'Jeonse'. Any return from the deposit for the contract period practically functions as rent to landowners.

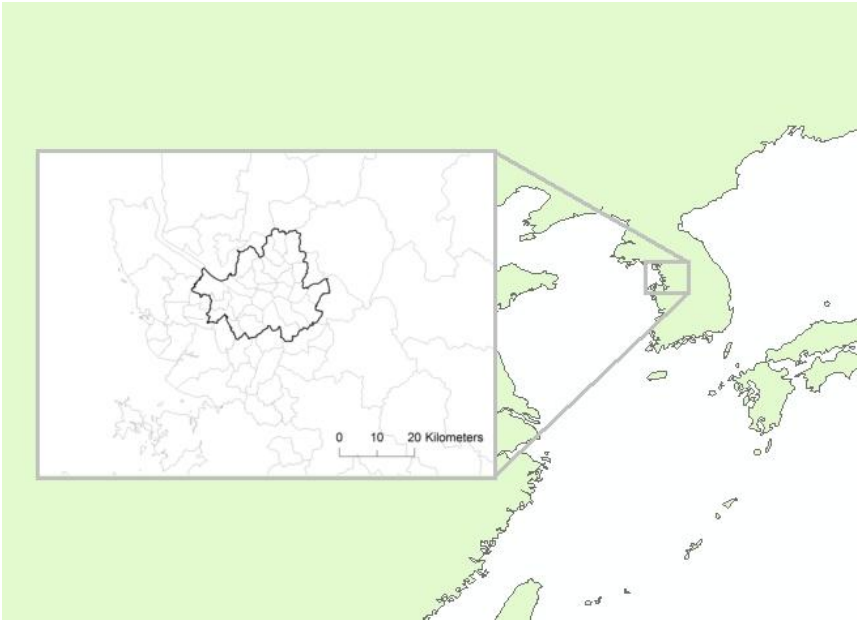

Figure 25 Location of Seoul

6-2-1 Data & range of analysis

Travel flows between local authorities from the commuting trip statistics of the 2005 Census data in South Korea were used for network analysis in order to visualise the commuting pattern in Seoul metropolitan area. The commuting data from the National Statistical Office of Korea are constructed using 10% sample data. The data contains the place of residence (origin), the place of work (destination), and total number of commuting people. A network analysis software, Pajek, is used for mapping commuting pattern in the same way as for the London data.

The 25 local authorities in Seoul, 10 in InCheon, and 31 from GyeongGi province are set as basic units of commuting. An Origin–Destination matrix from all 66 local authorities of Seoul, InCheon, GyeongGi province to all 66 local authorities was constructed for the network analysis. A total of 4355 pairs of origin – destination data are examined. In order to identify the relationship between local authorities, the commutings from an origin to itself and flows of 0 trips were removed. As a result, a total of 3930 pairs are left. For a simple visualisation, three thresholds of number of trips are used. There are 245 pairs of origin–destination where the number of trips exceeds 6,000, comprising 50.4% of total trips in all 66 local authorities. There are 117 pairs where the number of trips exceed 10,000, comprising 33.3% of total trips, and there are 53 pairs where the number of trips exceed 15,000 comprising 19.9% of total trips. The details are in the following table 8.

Table 8 The number of commuting trips in Seoul

Threshold	Number of pairs of origin - destination	Total number of trip	Percentage (%)
Total	3,930	5,722,710	100
6000	245	2,885,600	50.4
10000	117	1,904,800	33.3
15000	53	1,138,736	19.9

Source: S. Korea Census 2005

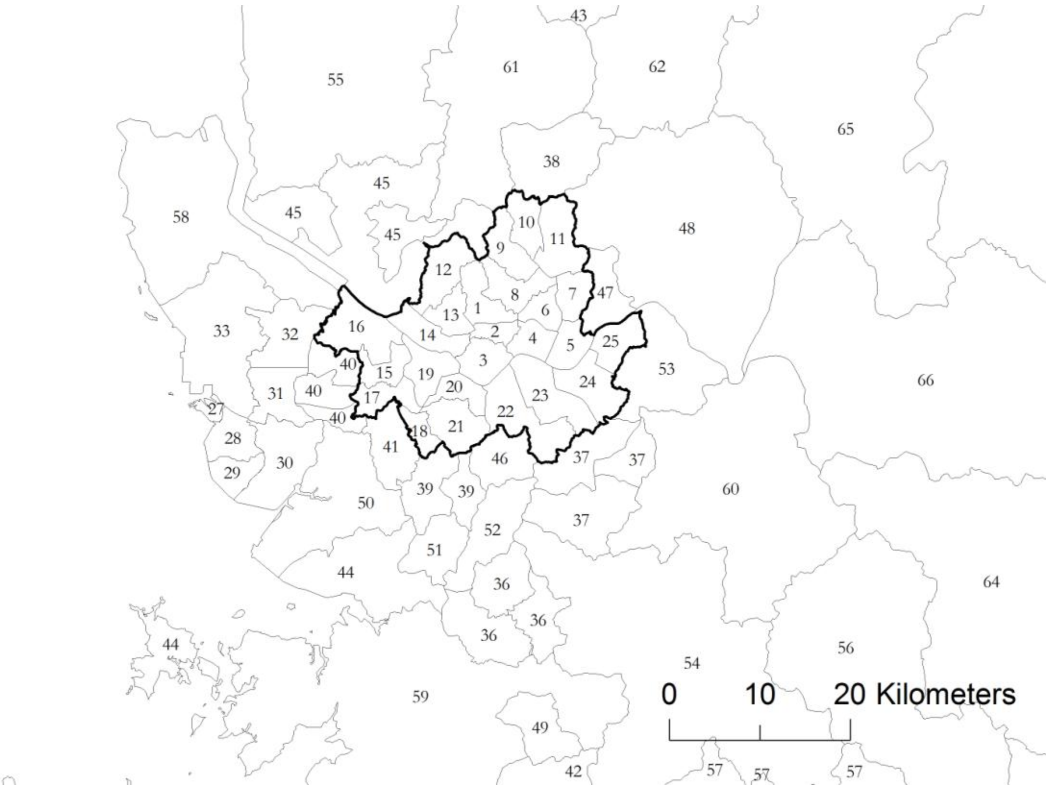

Figure 26 ID codes of local authorities in Seoul Metropolitan Area

6-2-2 Commuting patterns & centrality by local authority

In the following maps of commuting patterns, each vertex represents the centroid of each local authority, the size of each vertex represents the number of inflows of commuting to each vertex, and the arrows show the directions and the volume of commuting trips.

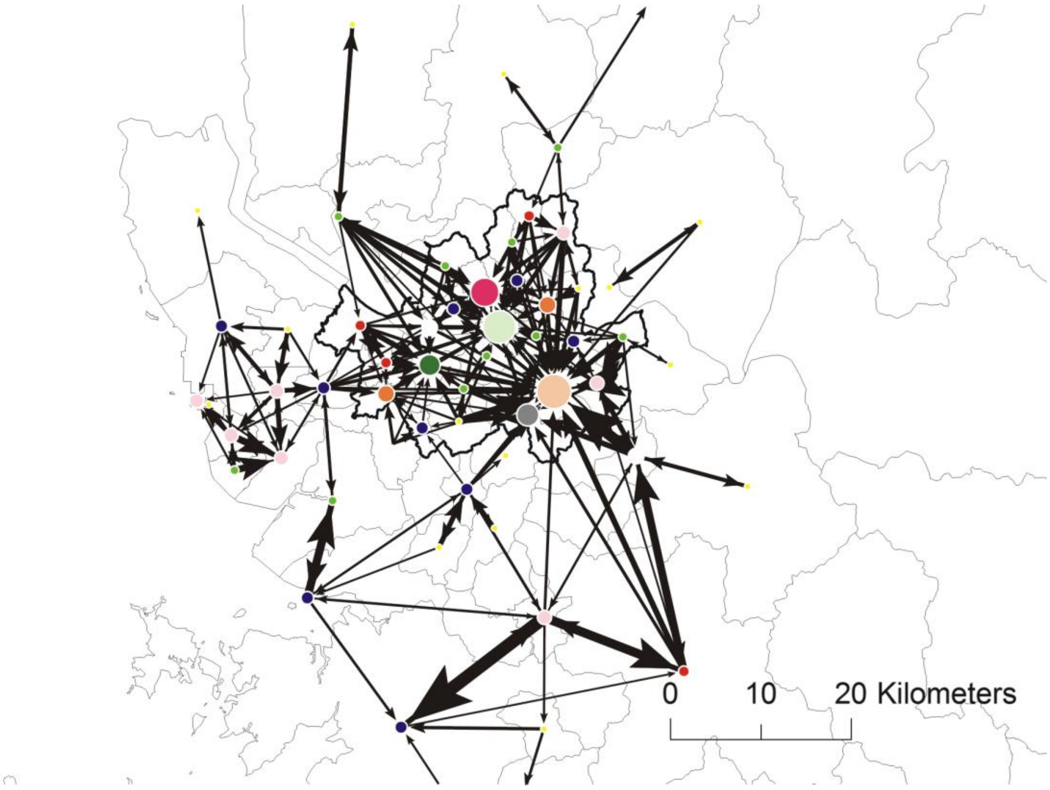

Figure 27 Commuting pattern and centrality by local authority in Seoul (over 6000 trip)

The three maps by threshold in Seoul show a consistency in the pattern of commuting. They all indicate that there are three main centres of commuting inflow in Seoul. In the commuting pattern diagrams, the prominent destinations of commuting inflows in Seoul are JongRo (2), YoungDeungPo (19), and GangNam (23), and, in the outer region of the administrative area of Seoul, InCheon (30), SiHeung (50), SuWon (36), and HwaSung (59). Excluding centres outside the administrative area of Seoul, the main destinations of commuting inflow in the Seoul metropolitan area are JongRo, YoungDeungPo, and GangNam. A closer observation of the commuting patterns reveals that there are affiliated destinations of commuting just next to JongRo, YoungDeungPo, and GangNam. A local authority Joong (1) is located just next to JongRo, GooRo (17) is close to YoungDeoungPo, and SeoCho (22) is close to GangNam. However, it is reasonable to suppose that these are merged jnto the three dominant centres due to their close proximities to them. Among the three main centres of inflow commuting to Seoul, GangNam and SeoCho have the most frequently commuted centres, as the number of incoming commuting trips per day is 808,650; JongRo and Joong have 613,071 incoming commuting trips, and YoungDeungPo and GooRo have 381,772 incoming commuting trips per day.

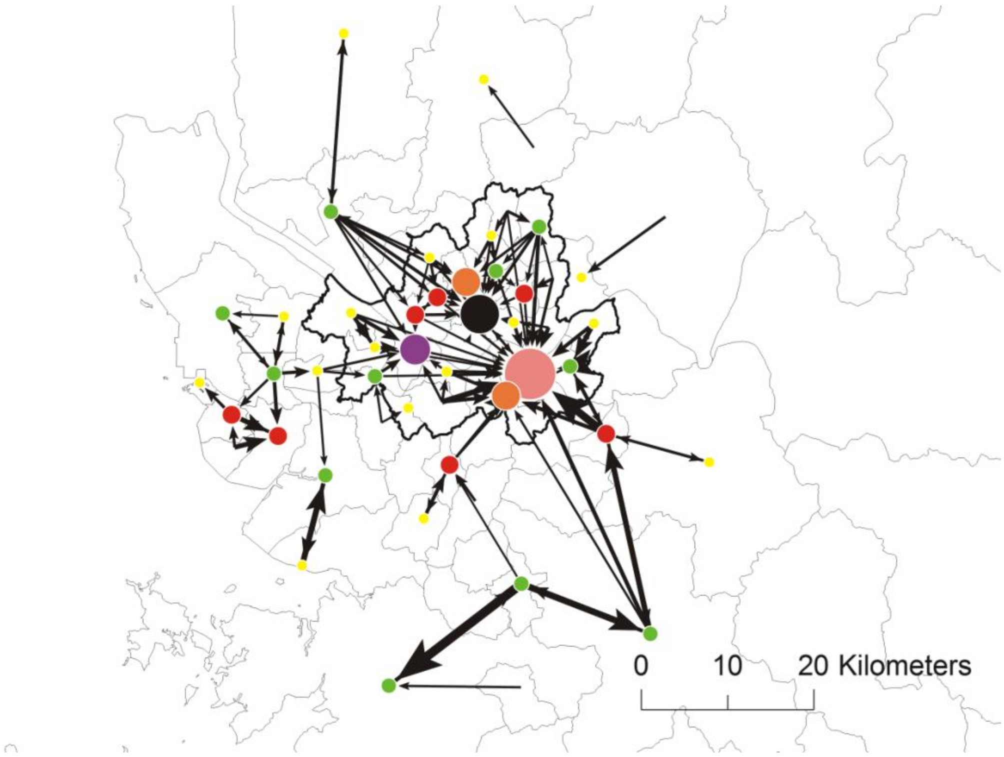

Figure 28 Commuting pattern and centrality by local authority in Seoul (over 10000 trip)

Commuting towards the three centres originate from all directions, whereas commuting towards other local authorities are limited in direction. This implies that the three centres are dominant centres and the other centres of local authorities are sub-centres in the main merging residential spheres. A local authority in the peripheral area of Seoul, GangDong (25), for example, has the dominant group of commuters to inner local authorities of SongPa (24) and GangNam (23). An inner area of SongPa has the dominant group of commuters to GangNam. However, it also has a dominant number of commuters from GangDong. This implies that GangDong lies at the bottom of the hierarchy, SongPa is above GangDong, and finally GangNam is at the top in a merged residential sphere.

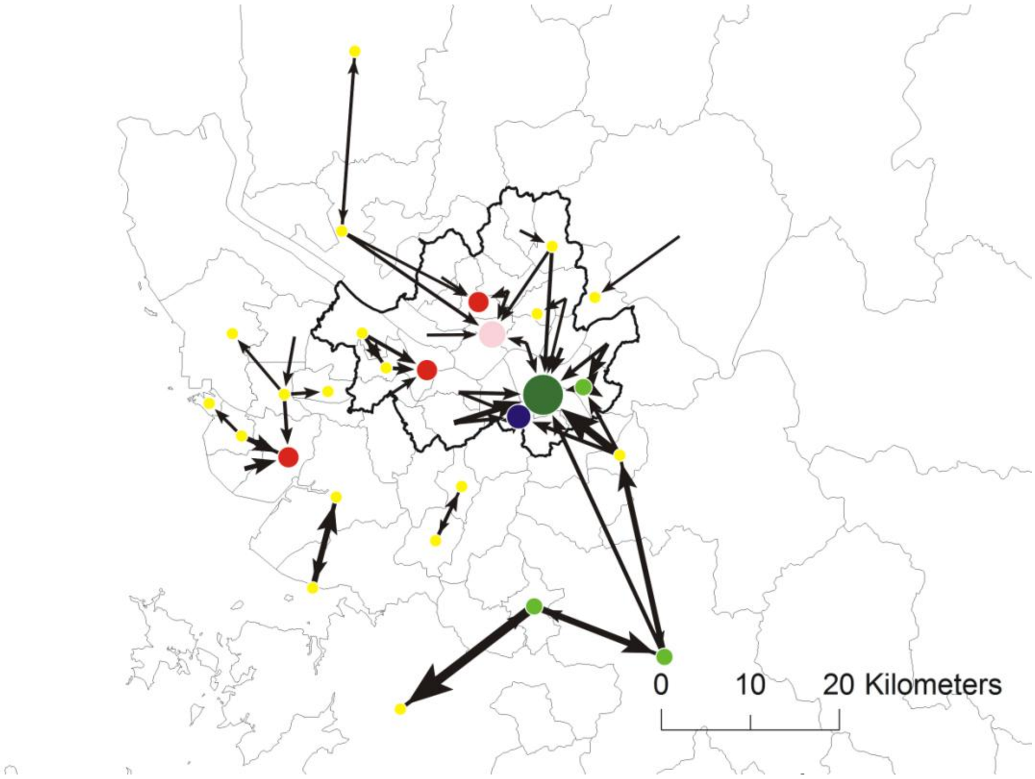

Figure 29 Commuting pattern and centrality by local authority in Seoul (over 15000 trip)

The border areas between the main centres have diverged outflow commuting to main centres around. Based on this, the borders between the main spatial submarkets can be identified. For example, DongJak (20) and GwanAk (21) which are the local authorities between the main centres of both GangNam and YoungDeungPo have similar levels of outflow commuters to GangNam and YoungDeungPo, which implies that the boundary between the two main submarkets lies in the local authorities of DongJak and GwanAk. In the same manner, SeongDong (4), GwangJin (5), DongDaeMoon (6), and JoongRang (7) would be the boundary between JongRo and GangNam, and Mapo (14) is the boundary between JongRo and YoundDeungPo.

6-3 Embodiment of house price and rent

Embodying a shape of house price or rent in a housing market can be a crucial process in the spatial analysis of a city. As we saw in the London case, it not only enables an overview of the basic structure of house prices in a city but it also provides important information on the spatial housing submarkets in a city. This process can provide useful criteria for the spatial subdivision of a housing market.

6-3-1 Data & range of analysis

To discover the spatial housing submarkets in Seoul, three types of housing are chosen as sectoral housing submarkets. The most dominant type of housing stock in Seoul is the apartment. They form more than 50 % of the total housing stock of Seoul in 2005. Three the most dominant groups of apartments were selected as sample groups. The first apartment group has 2 bedrooms with a floor area of around 60 m^2 (2 bedroom apartment). The second apartment group has 3 bedrooms with a floor area of around 85 m^2 (3 bedroom apartment). The third apartment group has 4 bedrooms with a floor area of around 120 m^2 (4 bedroom apartment). In the Seoul metropolitan area, 402 sample apartment complexes for the first group, 402 for the second, and 397 for the third were collected. For the time series analysis, price data were collected for 4 different points of time (1998, 2001, 2004, 2007) spanning a period of 10 years from 1998 to 2007. 'Jeonse' data as rent data was also collected. Structural data for properties and other data such as addresses, locations, and past transaction prices were also collected. Rent and price data for sample apartments and associated location data were constructed to shape the house prices of Seoul. With the help of the software 'Surfer', the shape of house prices of Seoul was modelled.

Detailed methods of data collection are as follows.

First, the geographical range of the study area was set to include the administrative areas of Seoul (25 local authorities), and the surrounding areas of conurbation including 15 small cities in GyeongGi province (SeongNam, UiJeongBu, AnYang, BuCheon, GwangMyung, GoYang, GwaCheon, GuRi, NamYangJu, SiHeung, GunPo, UiWang, HaNam, GwangJu, and GimPo), InCheon, and SooWon. Second, price and rent data were collected from Real Estate Bank (www.neonet.co.kr) which is one of the most reliable real estate information firms in South

Korea. The stratified sampling method was used for collecting house price and rent data. Around 8 properties per local authority were chosen, according to the proportion of populations. In sampling, the median values of price and rent were selected in order to control the problem of extreme values. Third, the structural data for properties (the number of bedrooms, the number of bathrooms, the floor area ratio, house type), past transaction prices, and addresses were collected from the same source. Fourth, location data, measured by longitude and latitude, were collected using a GIS web programme 'Google Earth'.

6-3-2 2-D contours & 3-D surfaces of house price and rent

2-D contours and 3-D surfaces of house price and rent were visually embodied in the same way as for the London data. 3 data sets of the longitude, the latitude, and price and rent data of the three sectoral housing submarkets were input to the programme to embody their shapes. For the coordinates data to fit into the programme, the longitude and the latitude data were transformed to location data measured by metres. The unit of apartment price and rent were unified to 10 \$ per m^2 to standardise the data and to compare it with other international data. The exchange rate of 1 \$/1000 ₩ is applied for the currency conversion over all periods.

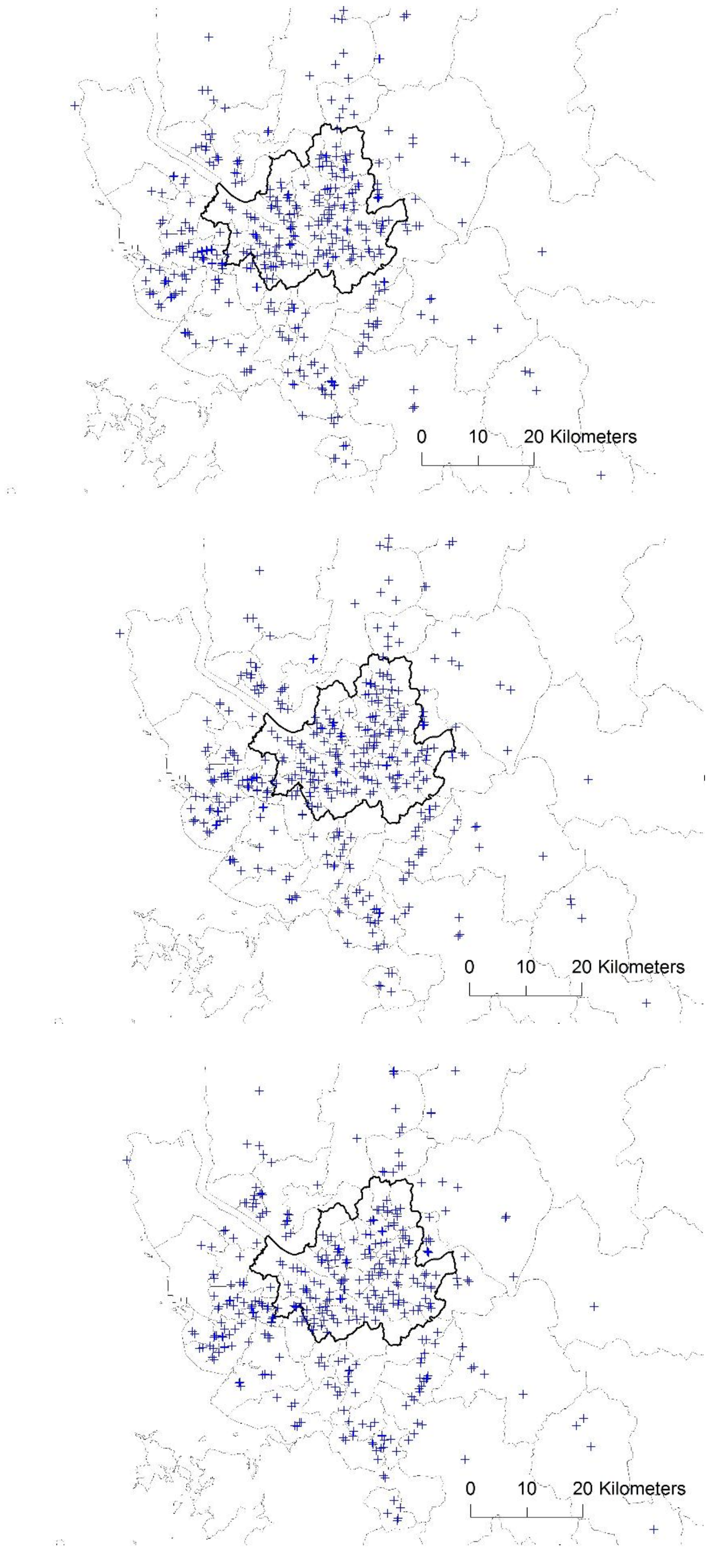

Figure 30 Location of sample apartments in Seoul

(2 bedroom, 3 bedroom, 4 bedroom from the top)

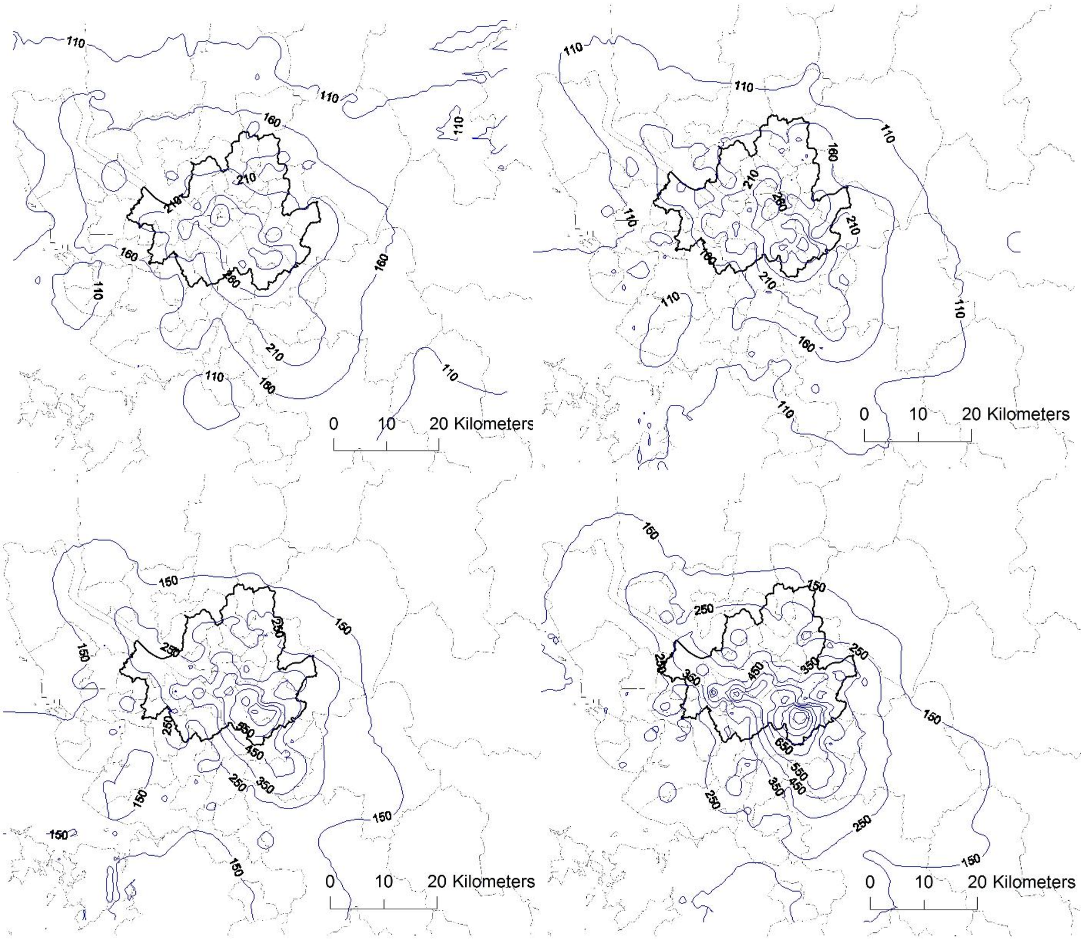

Figure 31 2D contours of 2 bedroom apartment prices in Seoul (10 $\$/m^2$)

(1998 top left, 2001 top right, 2004 bottom left, 2008 bottom right)

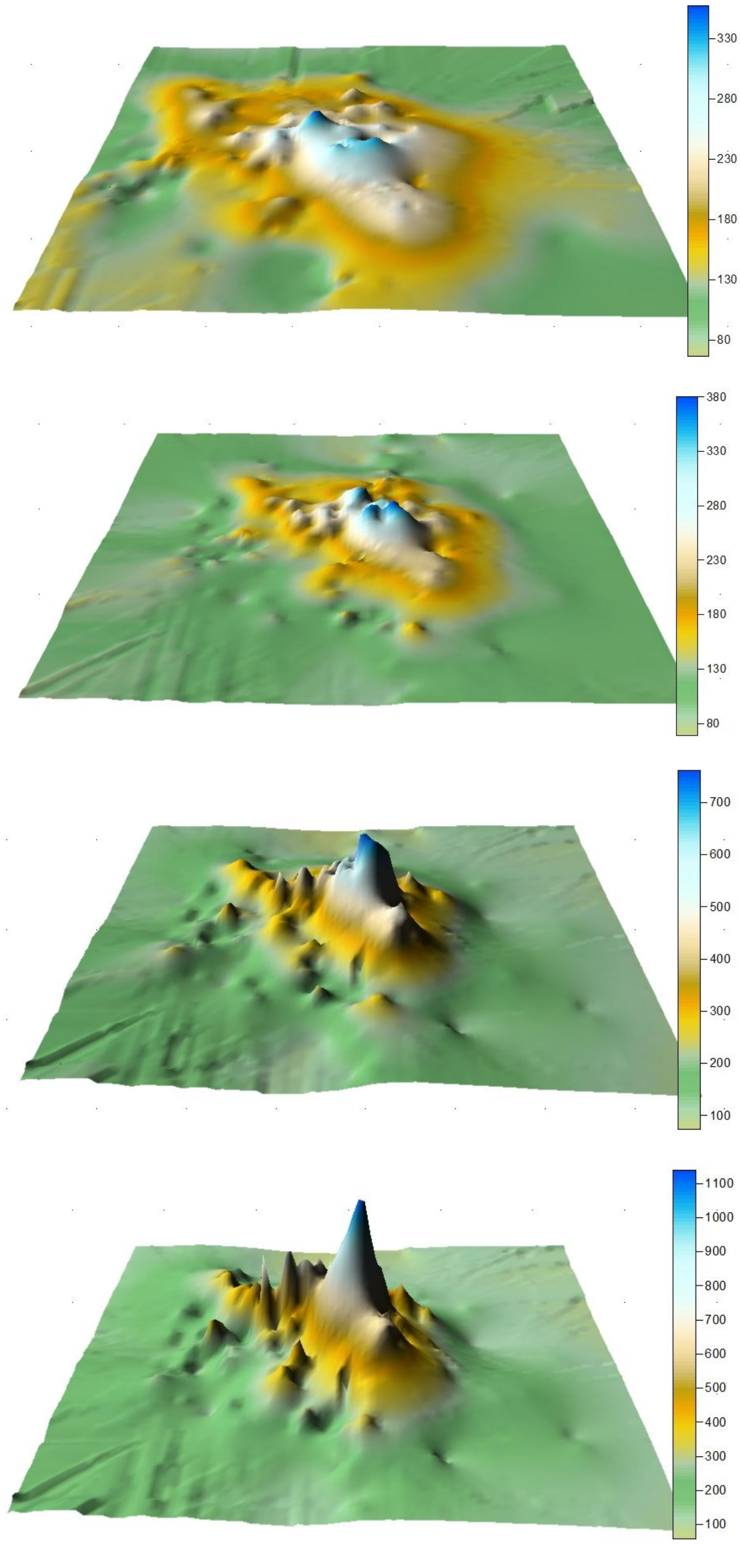

Figure 32 3D shapes of 2 bedroom apartment price in Seoul (10 \$/m^2)

(1998, 2001, 2004, and 2007 from the top)

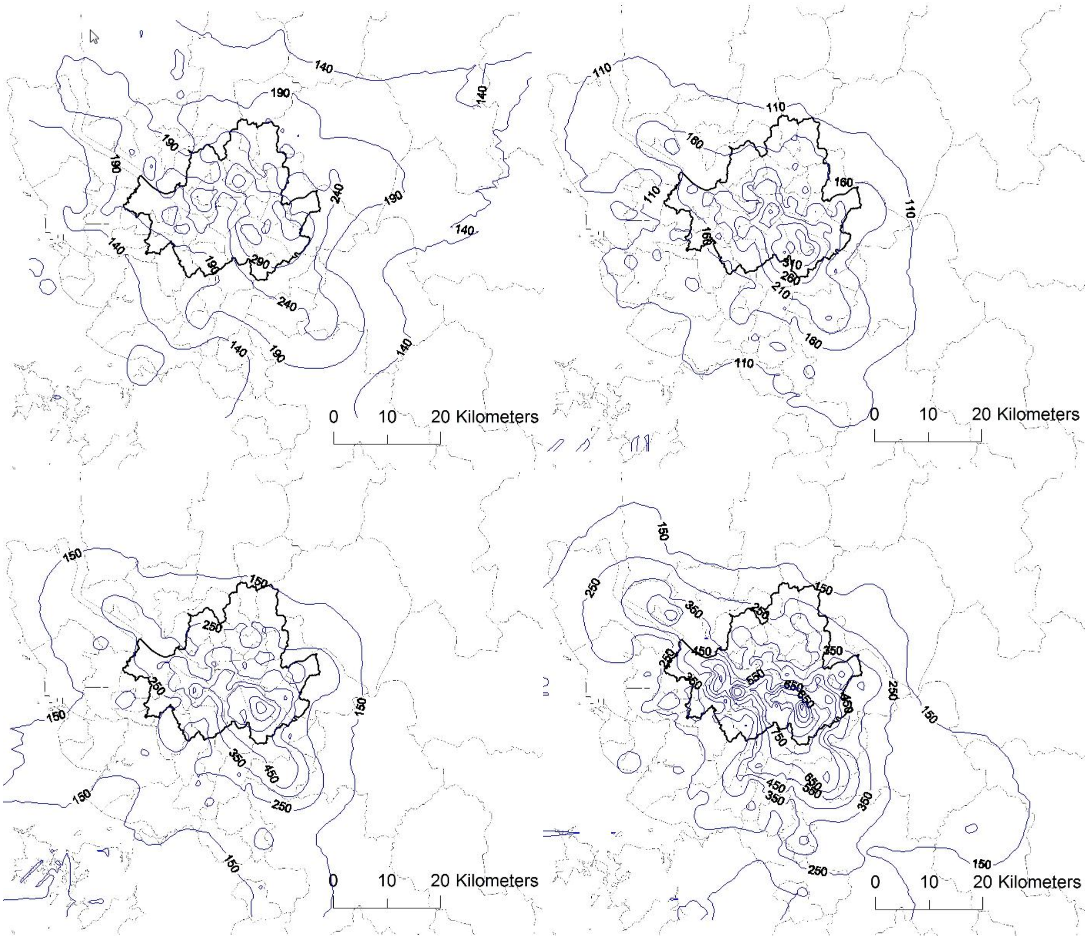

Figure 33 2D contours of 3 bedroom apartment prices in Seoul (10 $\$/m^2$)

(1998 top left, 2001 top right, 2004 bottom left, 2008 bottom right)

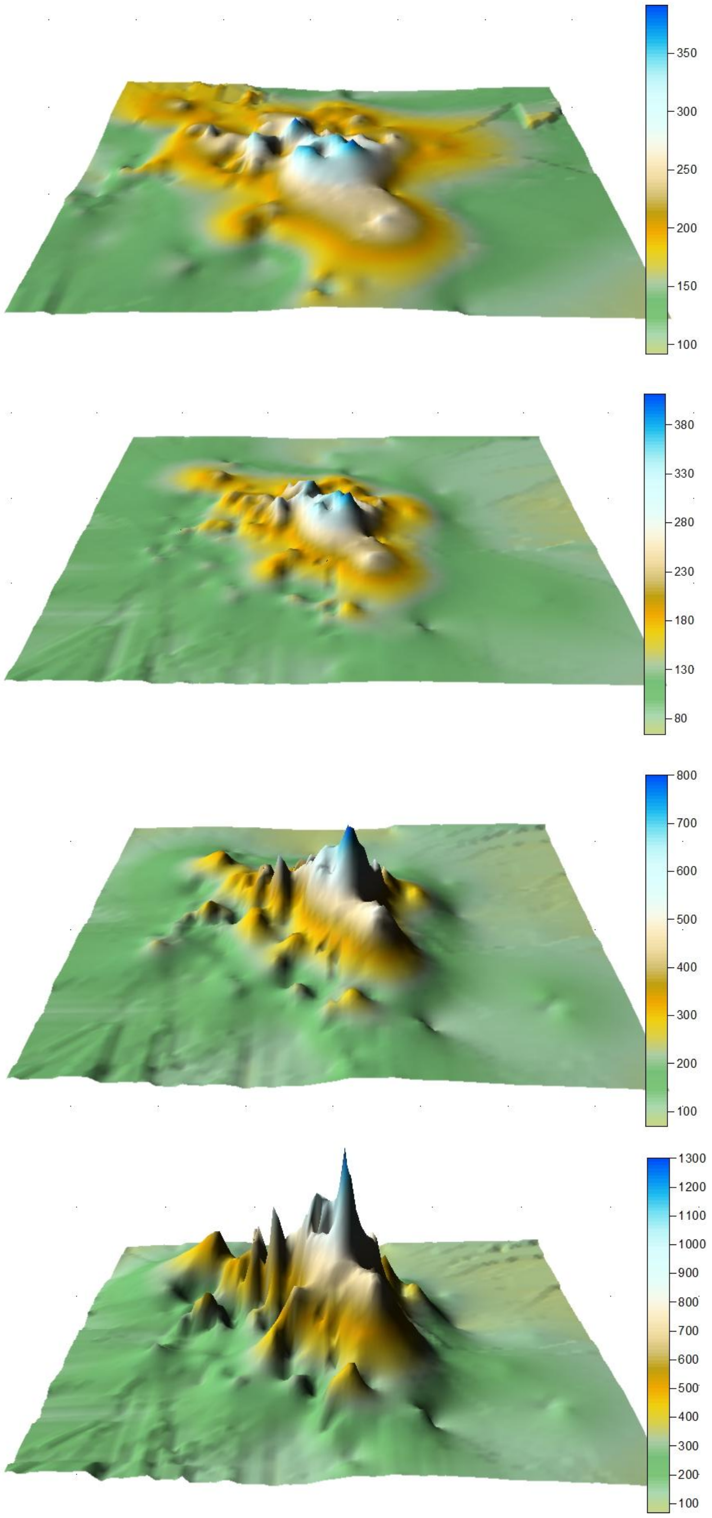

Figure 34 3D shapes of 3 bedroom apartment price in Seoul (10 $/m^2$)

(1998, 2001, 2004, and 2007 from the top)

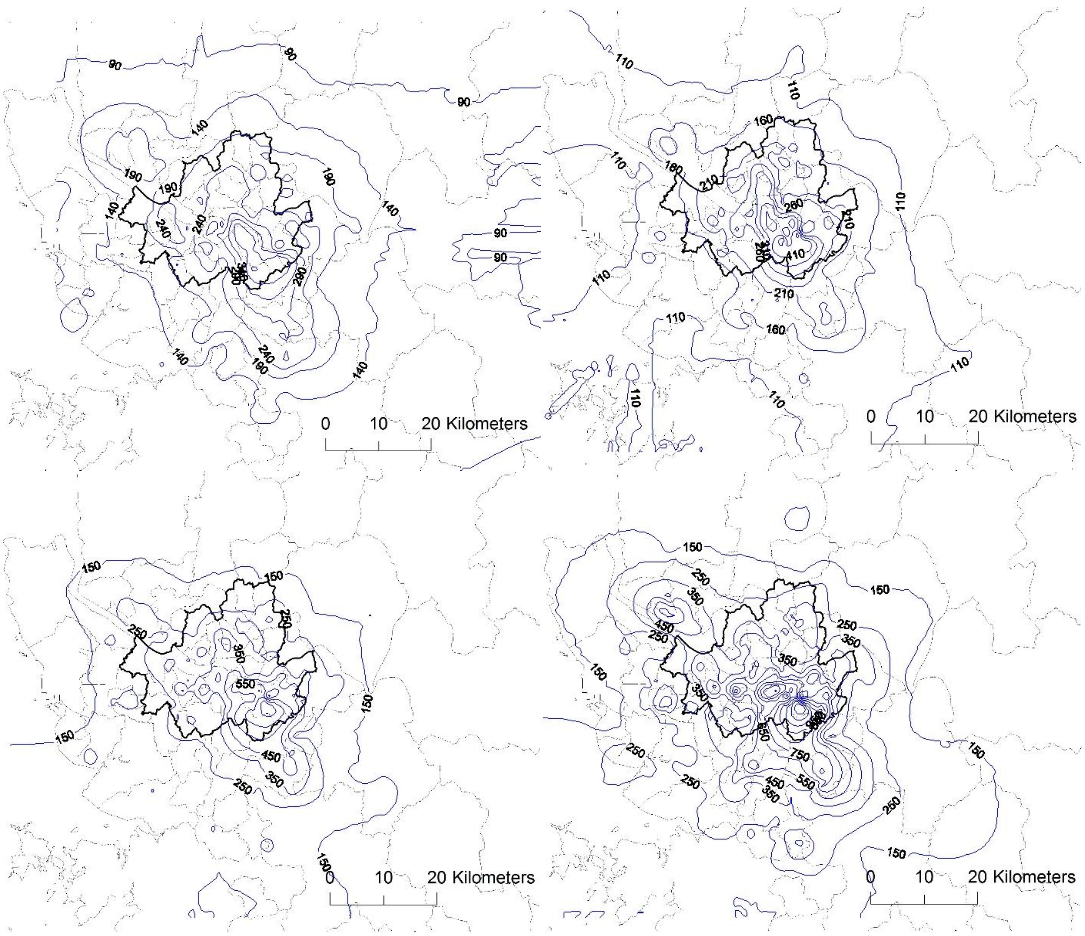

Figure 35 2D contours of 4 bedroom apartment prices in Seoul (10 $/m^2)

(1998 top left, 2001 top right, 2004 bottom left, 2008 bottom right)

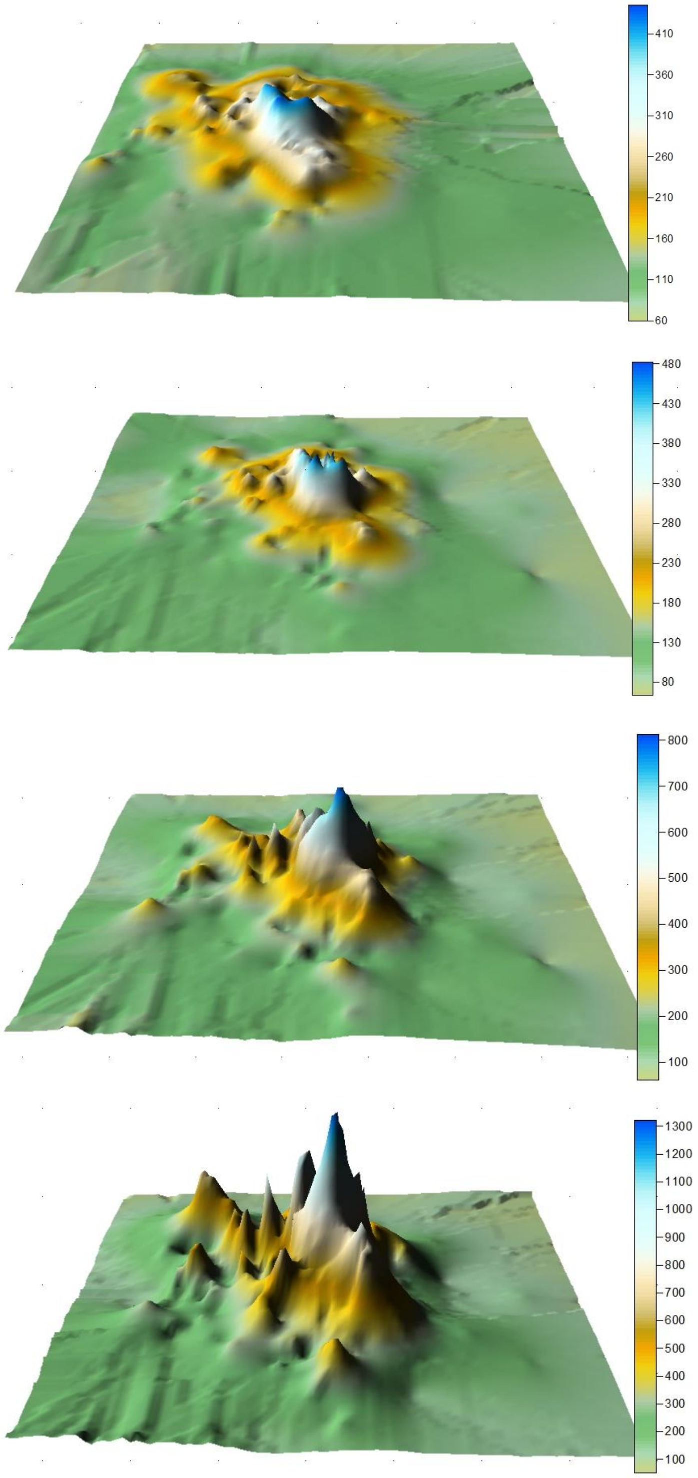

Figure 36 3D shapes of 4 bedroom apartment price in Seoul (10 $/m^2$)

(1998, 2001, 2004, and 2007 from the top)

2-D contours and 3-D shapes of apartment price in Seoul indicate that there are around 6 independent peaks in the whole area. Three of them in central area are the most dominant and these are partly merged each other. The rest of three peaks of InCheon, IlSan, and SooWon are located in the outer areas of the Seoul metropolitan area. The locations of the three dominant peaks are consistent with the major employment centres in Seoul of JongRo, YoungDeungPo, and GangNam. As the locations of other peaks are relatively distant and independent from Seoul, it might be sensible to regard Seoul as a partly merged residential sphere with 3 dominant centres of employment. The boundary of the partly merged unity of the three major cones is around 35 km from its centre. Thus the whole housing market of Seoul needs to be subdivided into three spatial submarkets for further analysis. This is consistent with the result of the commuting pattern analysis. It was not difficult to identify the three peaks until the period beginning 2001. After 2004, the dominance of one peak, GangNam, overshadows the other two peaks, so even in 2007 the shape of house prices in Seoul suggests only one completely merged residential sphere.

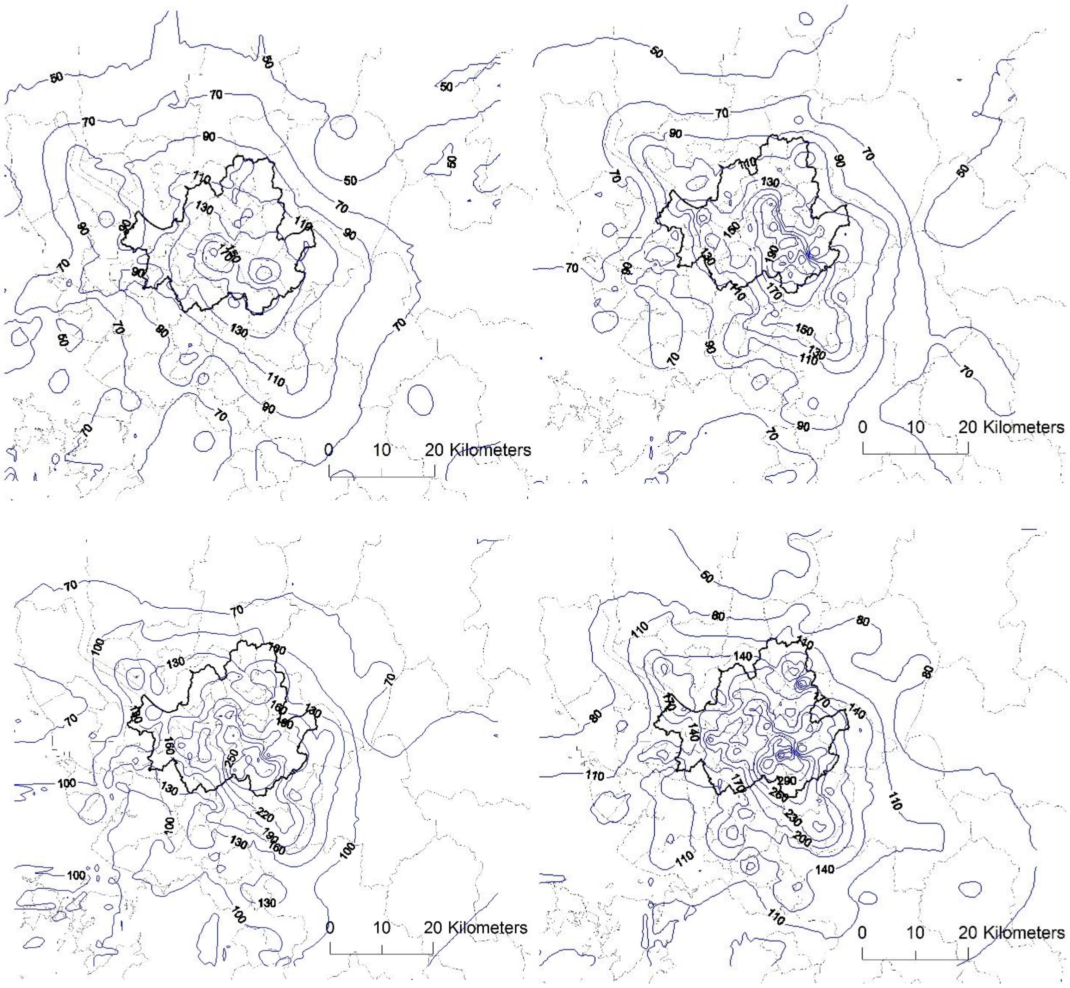

Figure 37 2D contours of 2 bedroom apartment rent in Seoul (10 $/m²)

(1998 top left, 2001 top right, 2004 bottom left, 2008 bottom right)

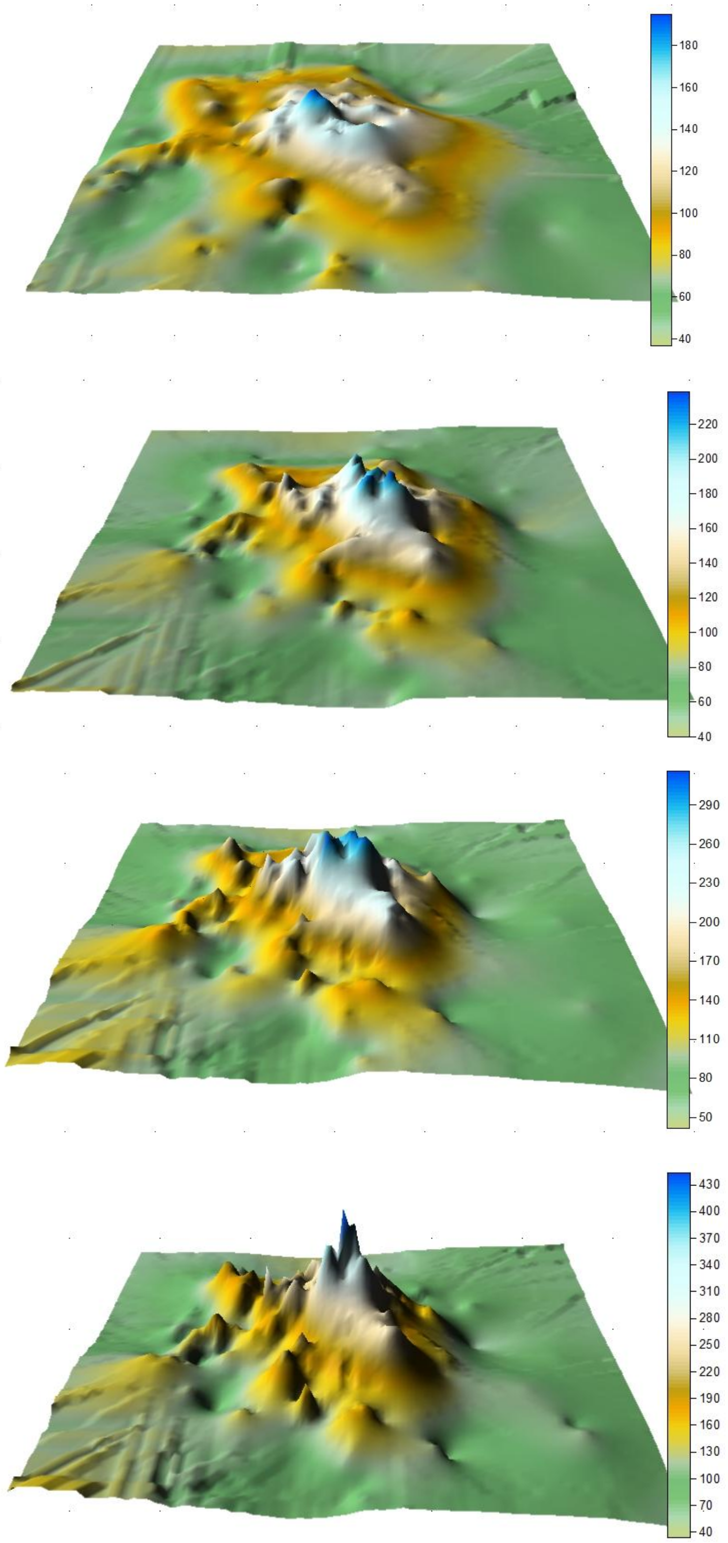

Figure 38 3D shapes of 2 bedroom apartment rent in Seoul (10 $/m^2)

(1998, 2001, 2004, and 2007 from the top)

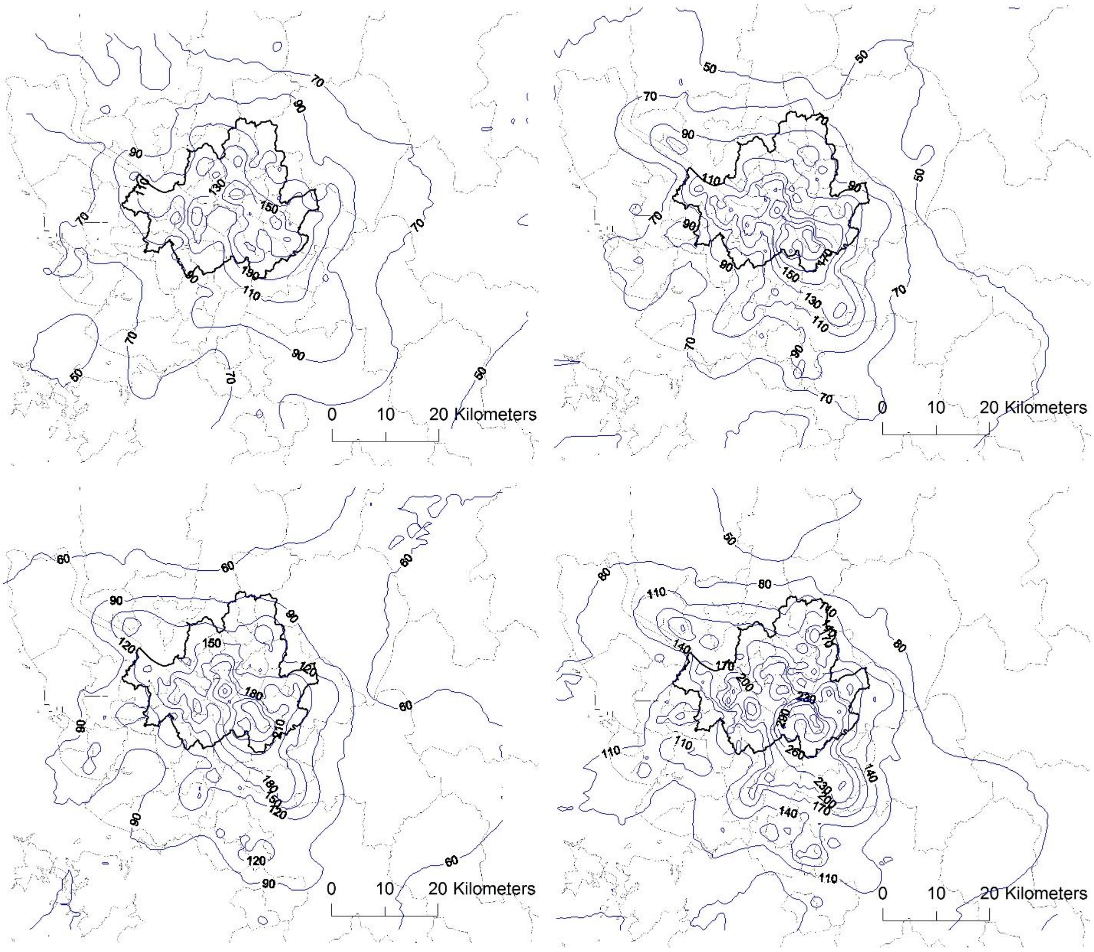

Figure 39 2D contours of 3 bedroom apartment rent in Seoul (10 $/m^2)

(1998 top left, 2001 top right, 2004 bottom left, 2008 bottom right)

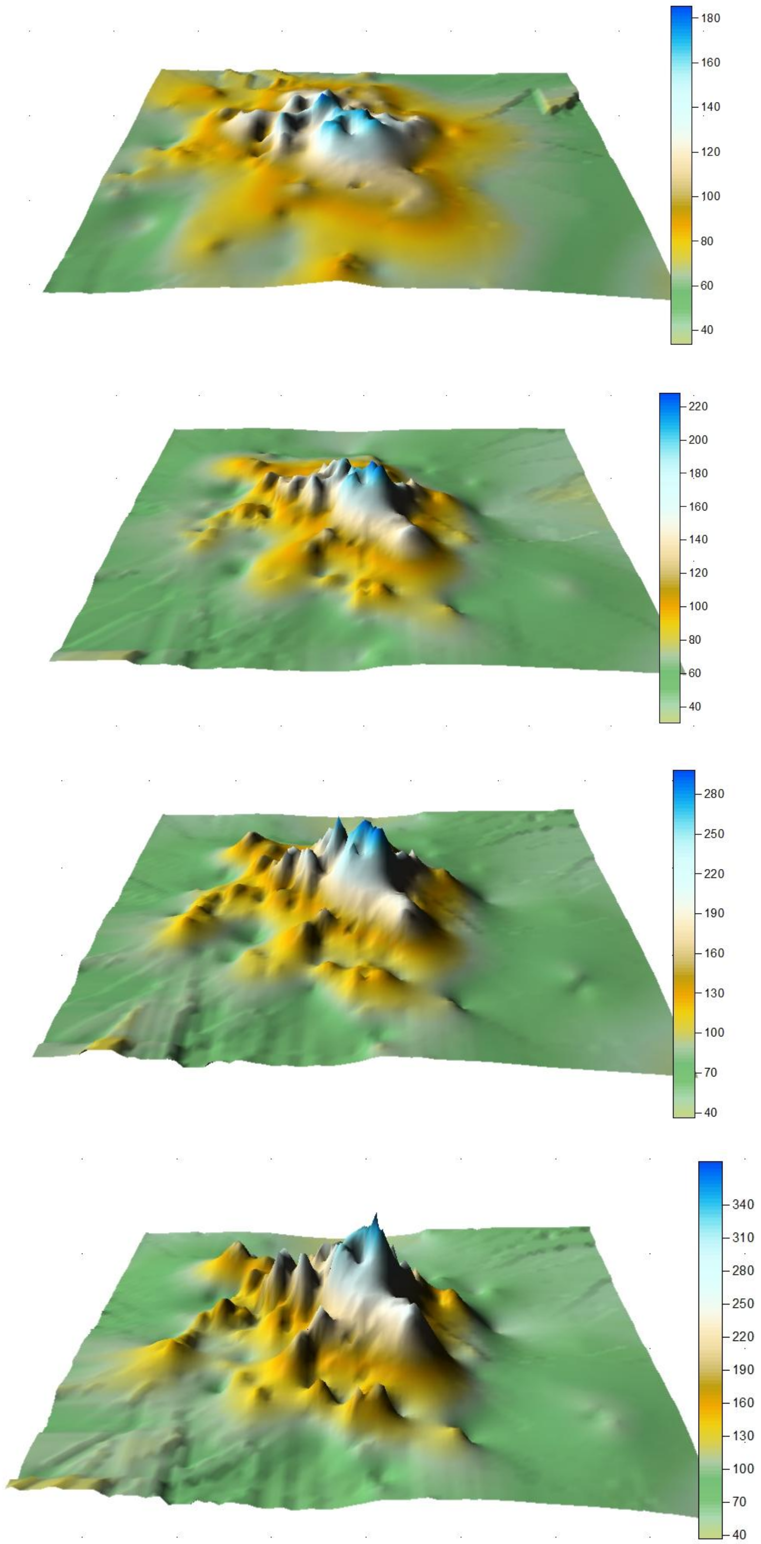

Figure 40 3D shapes of 3 bedroom apartment rent in Seoul (10 $/m^2)

(1998, 2001, 2004, and 2007 from the top)

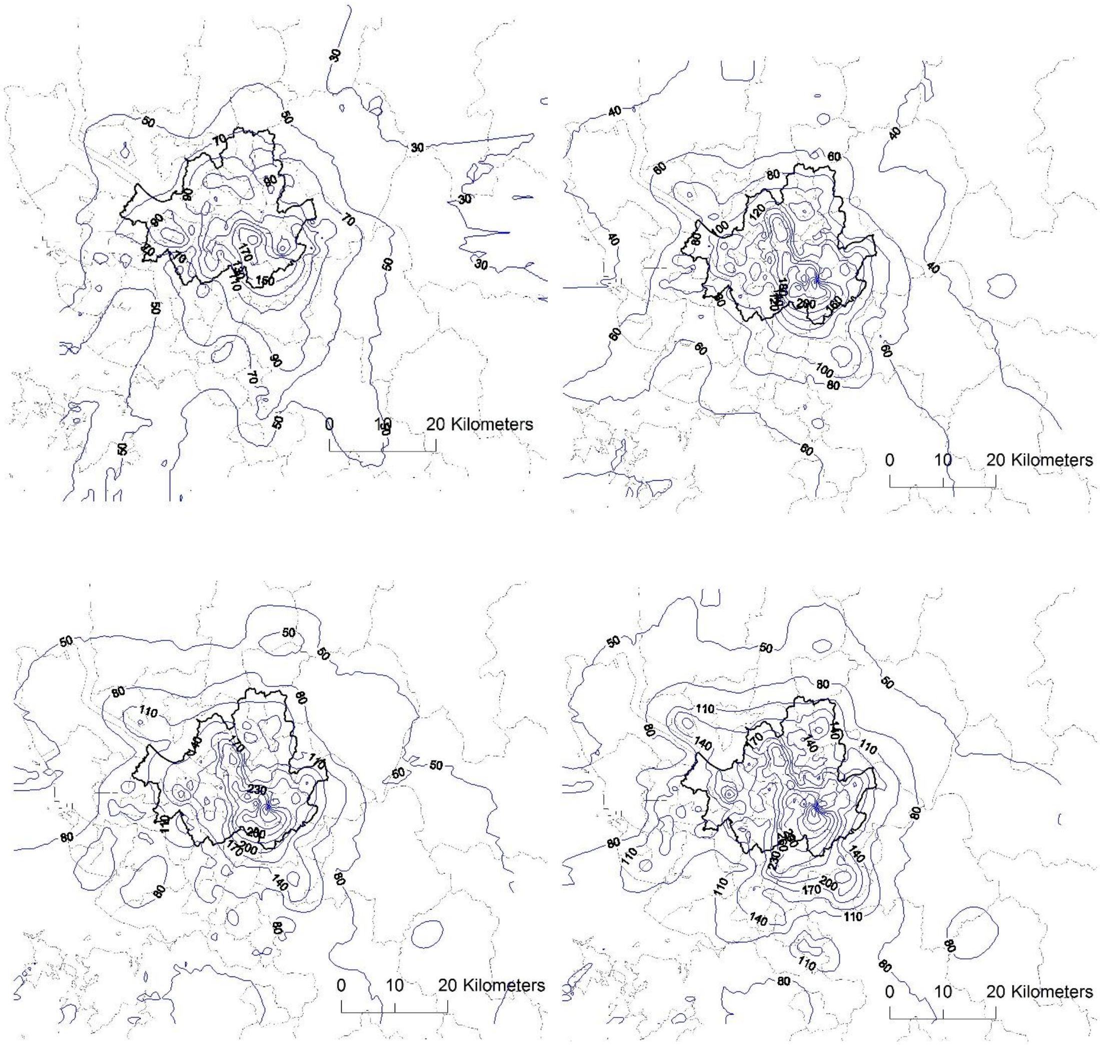

Figure 41 2D contours of 4 bedroom apartment rent in Seoul (10 $/m^2)

(1998 top left, 2001 top right, 2004 bottom left, 2008 bottom right)

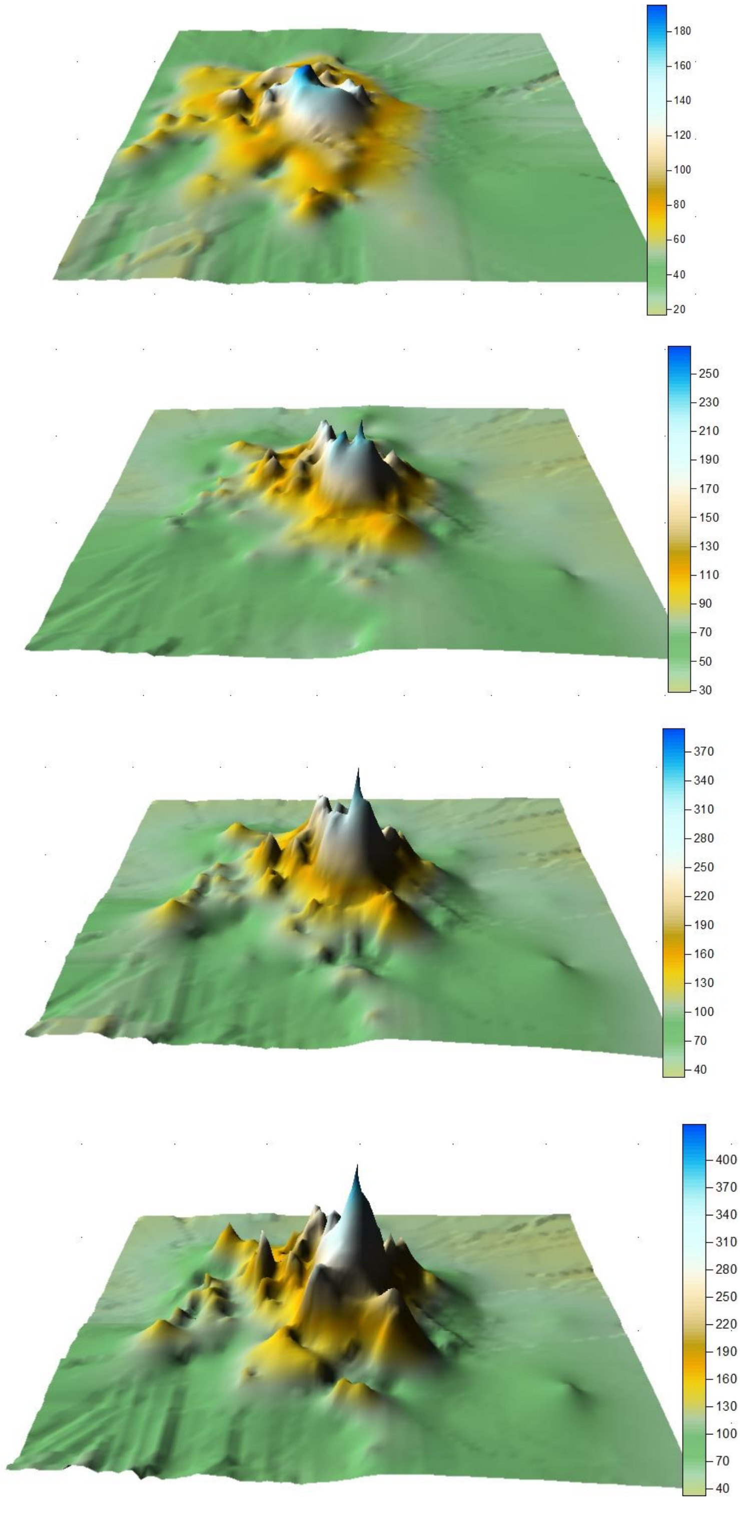

Figure 42 3D shapes of 4 bedroom apartment rent in Seoul (10 $/m^2)

(1998, 2001, 2004, and 2007 from the top)

The 2-D contours and 3-D shapes of apartment rent in Seoul demonstrates little difference to those of apartment price. However, the distinction between the three main centres of employment is clearer than when it is drawn with price data. It is partly because price data reflects future expectation for the market. It can be therefore interpreted that the market expects the dominant growth of the GS spatial submarket in Seoul while the rental market remains somewhat distinct.

The result of the tri-centred city structure as shown by the embodiment of the shape of house price is consistent with the result from the commuting patterns with dominant employment figures[82] in the three areas. Therefore, it can be concluded that Seoul has three dominant centres of employment and associated residential spheres, and the whole housing market can be divided into three spatial housing submarkets. In the spatial division of housing submarkets, the borders between dominant cones can be regarded as the boundaries of each spatial submarket.

6-4 Subdivision of housing market

The maps of the commuting pattern with network analysis show that there are three main centres of commuting inflows in Seoul. The 2 dimensional contours and 3 dimensional embodiment of house price also reveal that there are three major peaks in Seoul. These imply that there exist three main spatial housing submarkets in Seoul. They are the GangNam-SeoCho (GS), Joong-JongRo (JJ), and YoungDeungPo-GooRo (YG) spatial housing submarkets. GangNam and SeoCho are so close that they form a centre of merged residential spheres. So do Joong and JongRo, and YoungDeungPo and GooRo. The borders between the three spatial housing submarkets would keep changing, due to the differing relative dominance of each, mainly in terms of the employment level. The borders between the submarkets are based on the commuting data in 2005 and the embodiment of rent is based on figures from 2004. These borders will be used in the following analysis. The geographical boundaries of the three spatial housing submarkets of GS, JJ, and YG are around 35 km, 32 km, and 28 km radius respectively. In terms of the sectoral housing submarket, the three sectoral housing submarkets of 2 bedroom, 3 bedroom, and 4 bedroom apartments will be the subject of the following analysis.

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[82] See appendix 6-8

Table 9 Number of sample apartments by submarket in Seoul

Spatial sub / Sectoral su	GS	JJ	YG
2 bedroom apartment	125	135	155
3 bedroom apartment	125	135	155
4 bedroom apartment	123	123	153

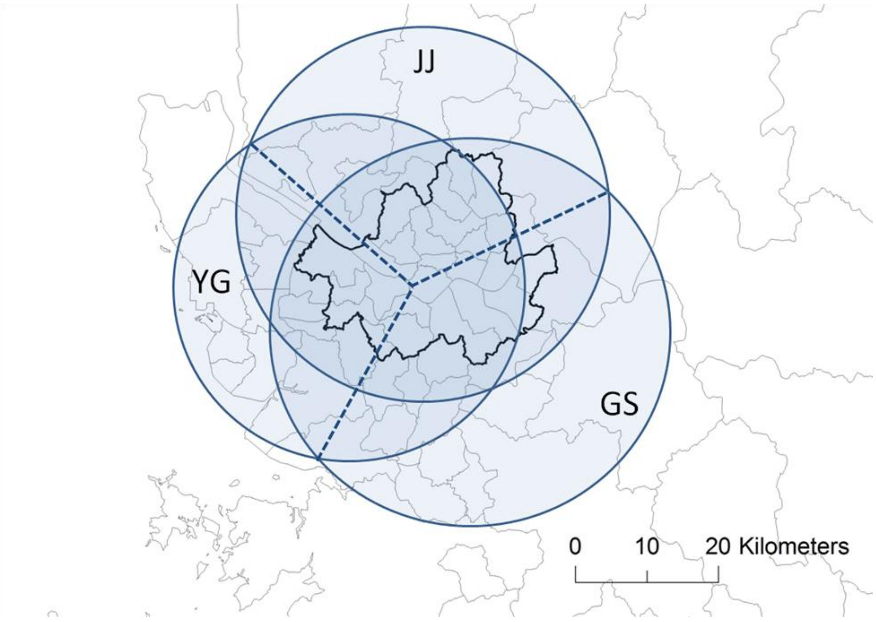


Figure 43 Major spatial housing submarkets in Seoul

6-5 The spatial structure of the housing market

6-5-1 Data & range of analysis

As the centres of the three dominant spatial housing markets are not close enough to be fully merged into one, the whole housing market of Seoul needed to be divided into three spatial housing submarkets. For the further regression analysis, the centre of each spatial housing submarket needs to be identified. Based on the commuting patterns established from network analysis and employment data, the location of the centre of GS spatial housing submarket is identified as YeokSam station, which is the central area of the local authority of GangNam. In the same way, the location of the centre of JJ spatial housing submarket is identified as EulJiRo 1Ga station, which is the central area of the local authority of JongRo, and the location of the centre of YG spatial housing submarket is identified as YeoUiDo station, which is also the central area of the local authority of YoungDeungPo. YeokSam station, EulJiRo 1Ga station, and YeoUiDo station are assumed to be centres of the three main spatial housing submarkets of GS, JJ, and YG in Seoul. In order to transform the location data from longitude and latitude to metres, the length of 1 degree latitude is converted to c.111 km and the length of 1 degree longitude is converted to c. 88.35 km. In this manner, the location of YeokSam station is [3.24 km E, 55.59 km N], the location of EulJiRo 1Ga station is [1.55 km W, 62.81 km N], and the location of YeoUiDo station is [6.70 km W, 57.91 km N], where 127° longitude is the base line of the X coordinate and 37° latitude is the base line of the Y coordinate. Physical linear distances from each location to YeokSam station, EulJiRo 1Ga station, and YeoUiDo station were constructed. The unit of apartment price and rent is 10 dollars per m^2. The exchange rate of 1 $/1000 ₩ is applied for currency conversion over all periods. The unit of physical distance is km.

6-5-2 Regression analysis of price and rent on accessibility by submarket

A simple OLS regression analysis of price and rent on the distance to the centres of each spatial housing submarket has been conducted in this section. Through this process, the contribution of accessibility to the centres of each spatial housing submarket to cost of buying or renting apartments can be examined. In addition, the coefficients of gradients and constants can be applied to analyse the structure of land rents in an urban context.

The first regression analysis is on the relationship between apartment price and the distance to the centres. The regression analysis is conducted by spatial housing submarkets (GS, JJ, YG) and sectoral housing submarkets (2 bedroom apartments with a floor area of around 60 m^2, 3 bedroom apartments with a floor area of around 85 m^2, 4 bedroom apartments with a floor area of around 120 m^2). A total of 402 sample apartment complexes for 2 bedroom apartments, 402 for 3 bedroom, and 397 for 4 bedroom are used for the analysis. Scatter plots, regression fit lines, and 95% confidence intervals of the three main spatial housing submarkets in Seoul have been drawn by year from 1998 to 2007 in the following diagrams. The statistical results from the regression of R^2, coefficients, t-values, and 5th percentiles can be seen on the tables.

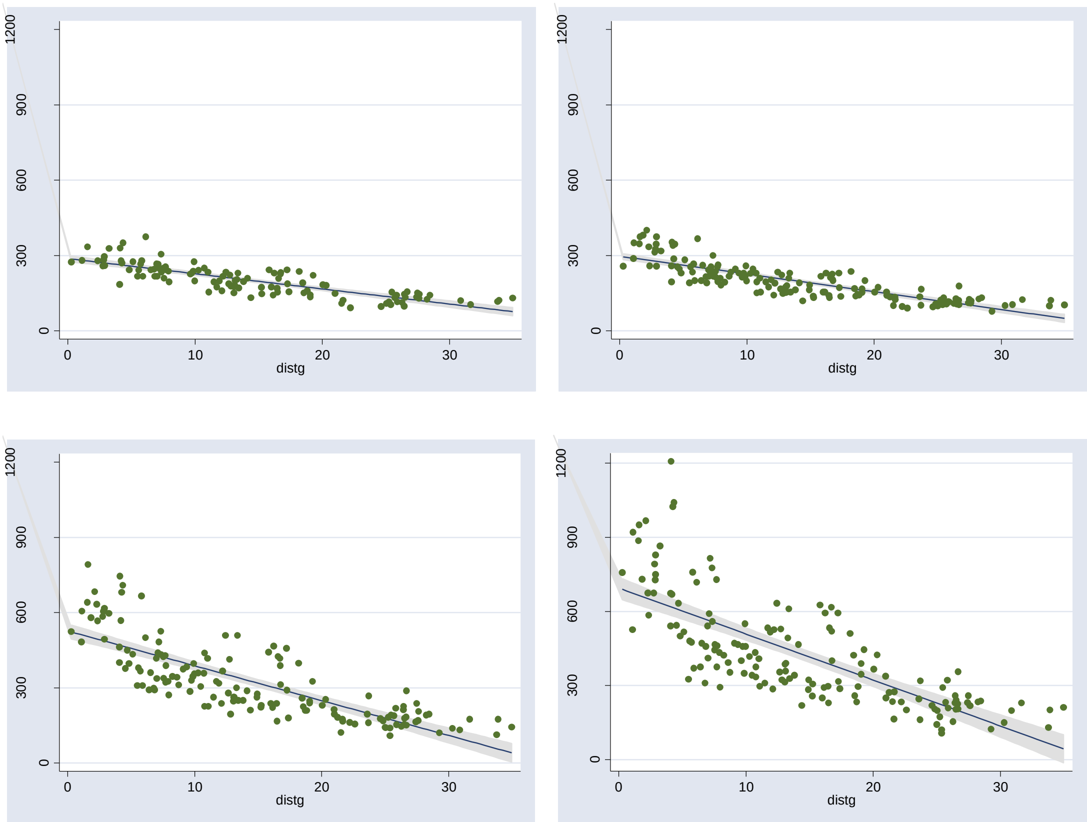


Figure 44 **Scatter plot of 2 bedroom apt price on distance to employment centre in GS of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)**

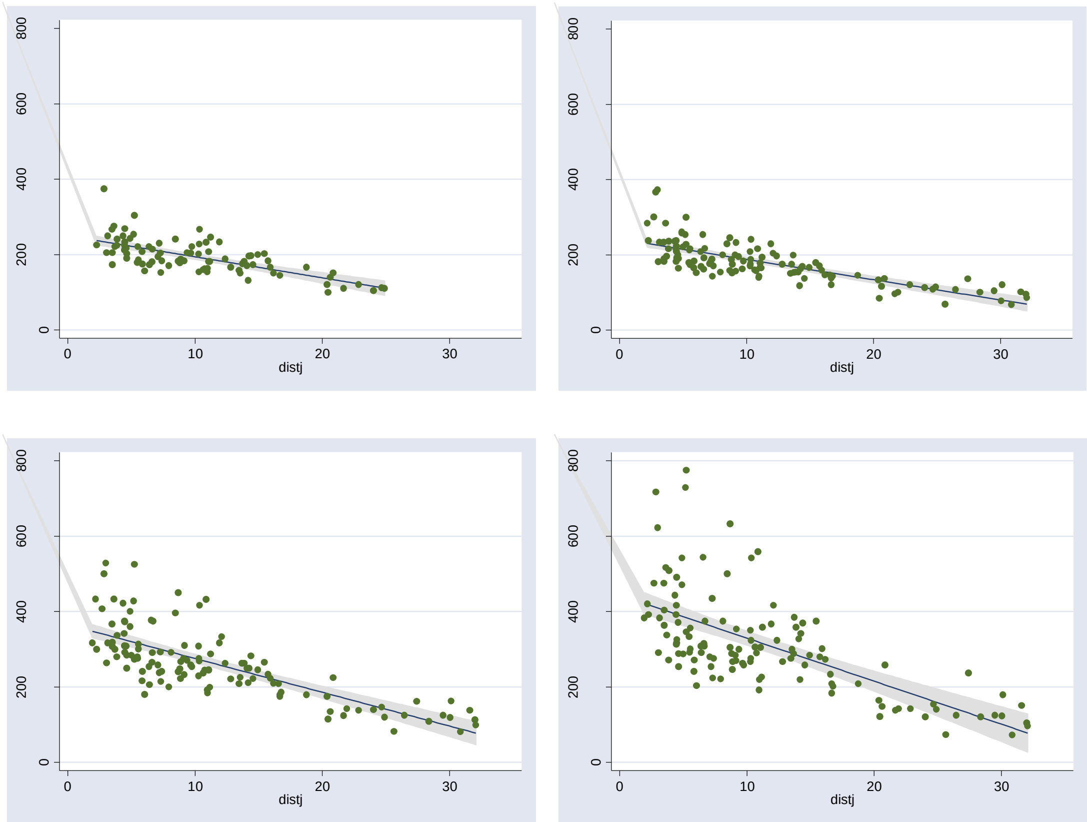
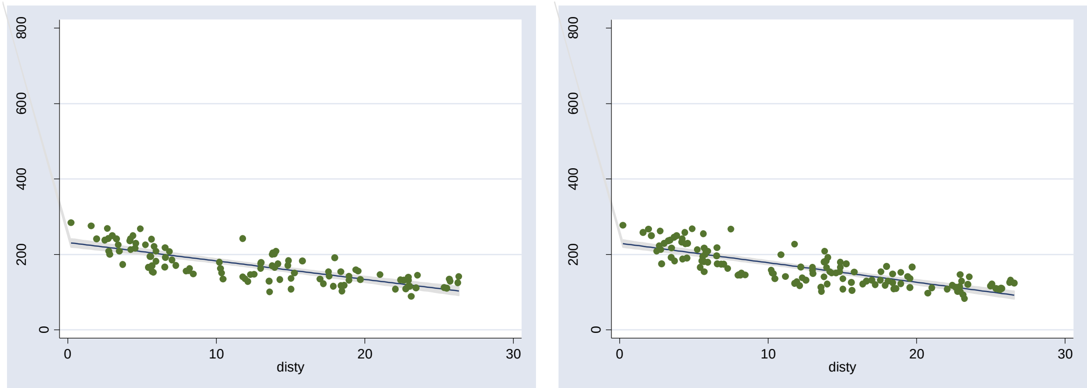


Figure 45 Scatter plot of 2 bedroom apt price on distance to employment centre in JJ of Seoul

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)



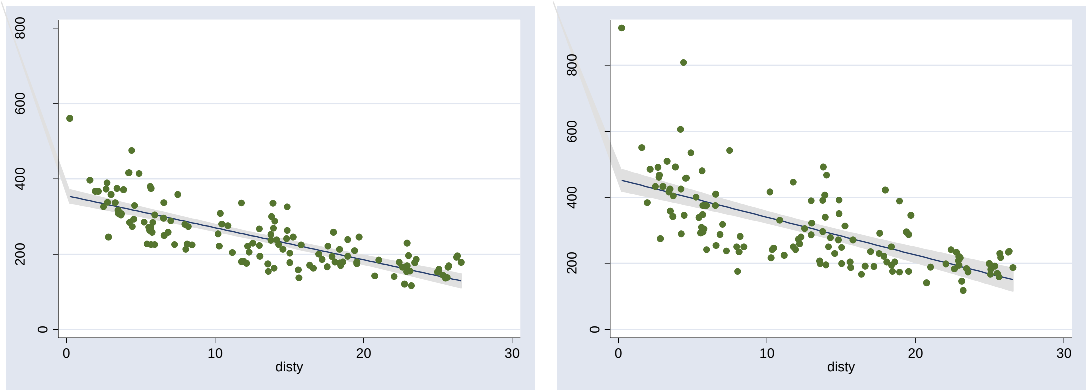


Figure 46 Scatter plot of 2 bedroom apt price on distance to employment centre in YG of Seoul

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

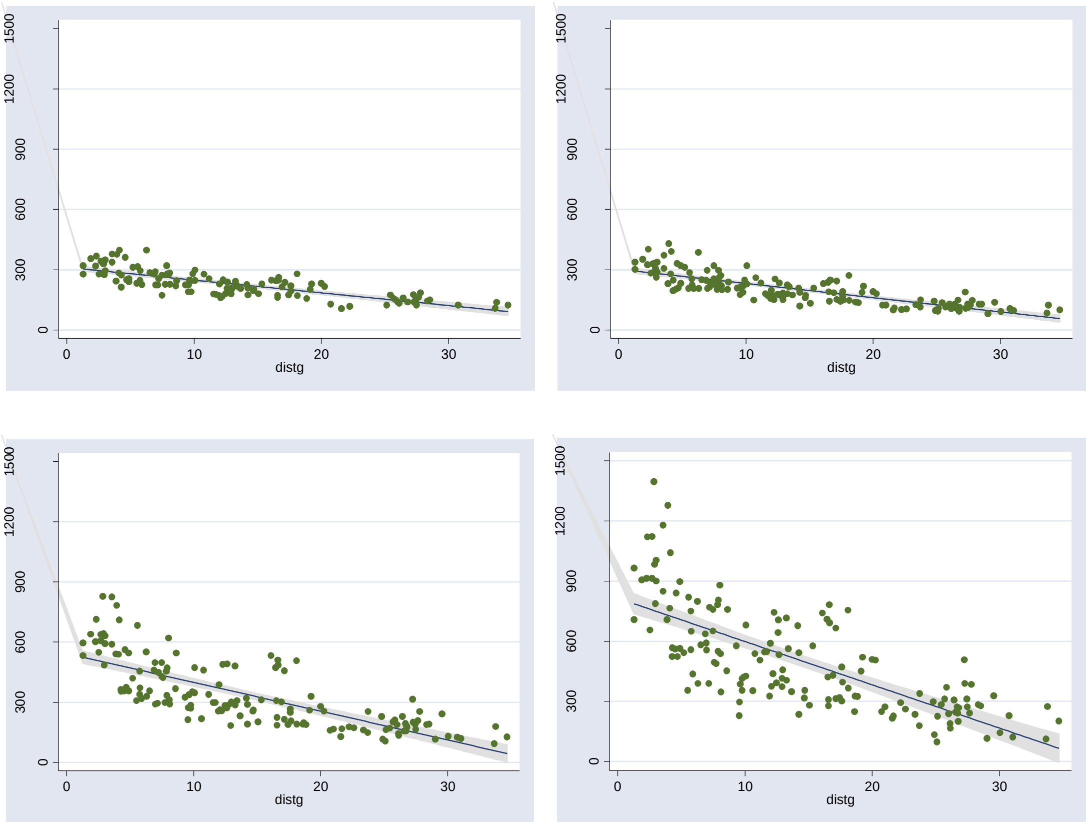


Figure 47 Scatter plot of 3 bedroom apt price on distance to employment centre in GS of Seoul

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

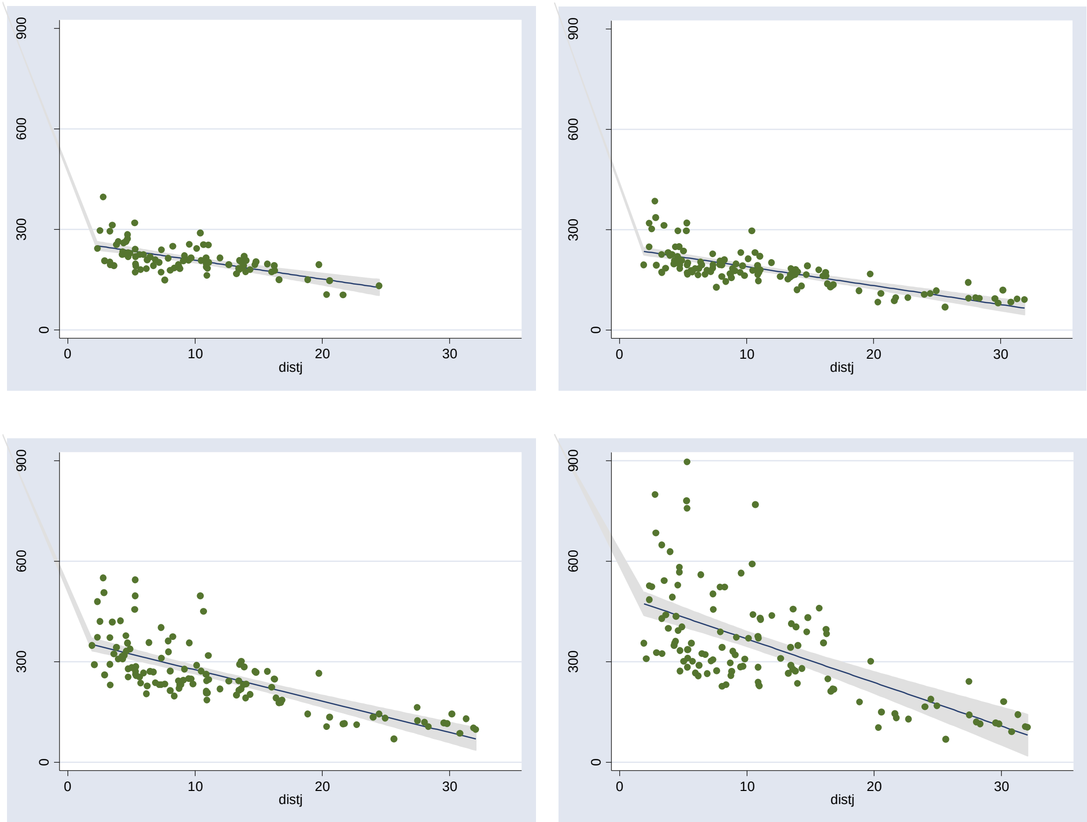
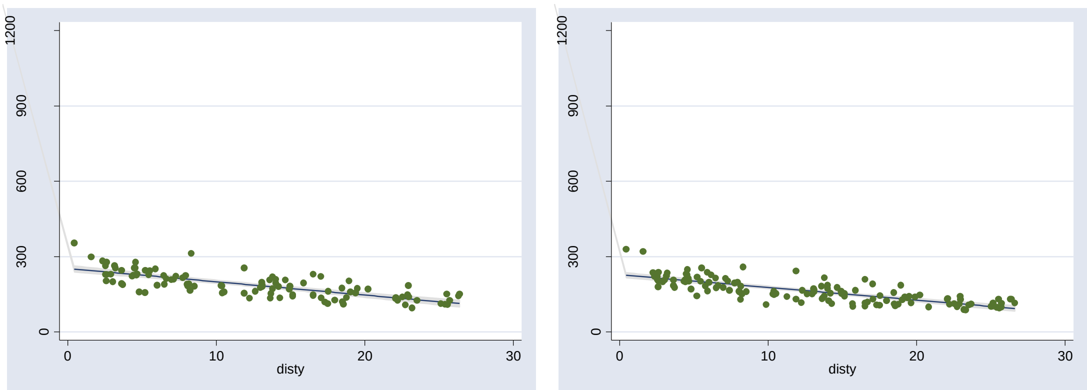


Figure 48 **Scatter plot of 3 bedroom apt price on distance to employment centre in JJ of Seoul**

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)



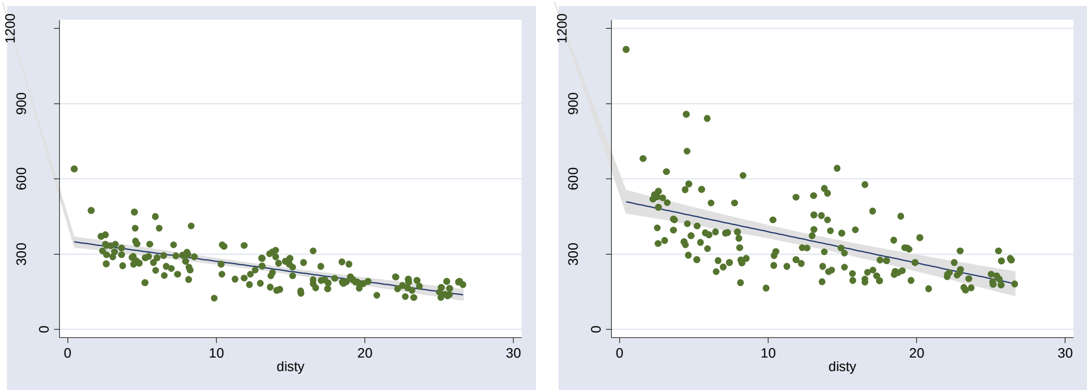


Figure 49 Scatter plot of 3 bedroom apt price on distance to employment centre in YG of Seoul

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

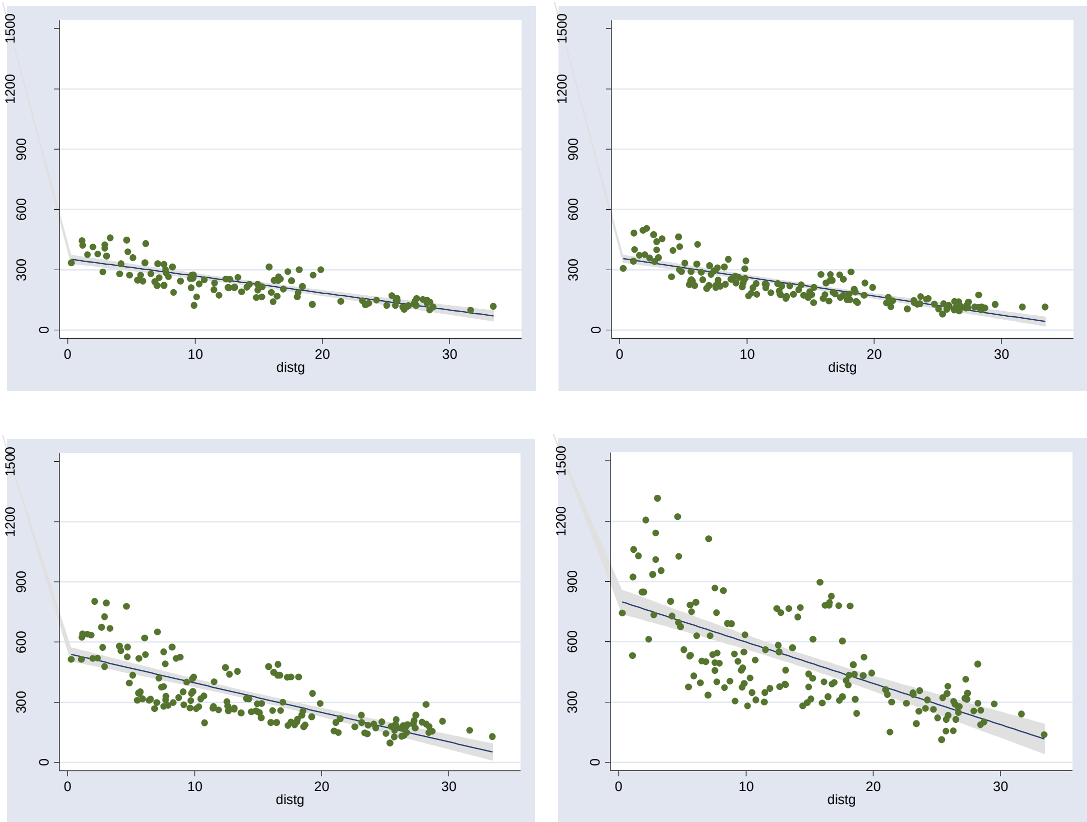


Figure 50 Scatter plot of 4 bedroom apt price on distance to employment centre in GS of Seoul

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

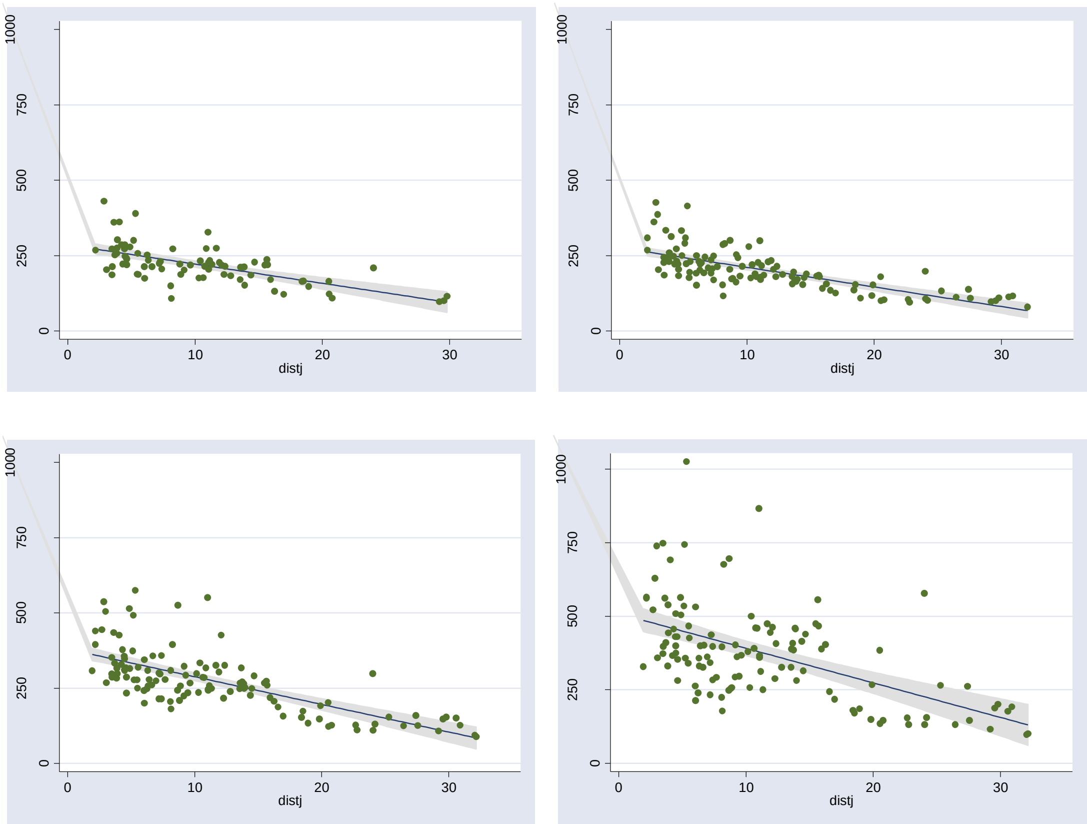
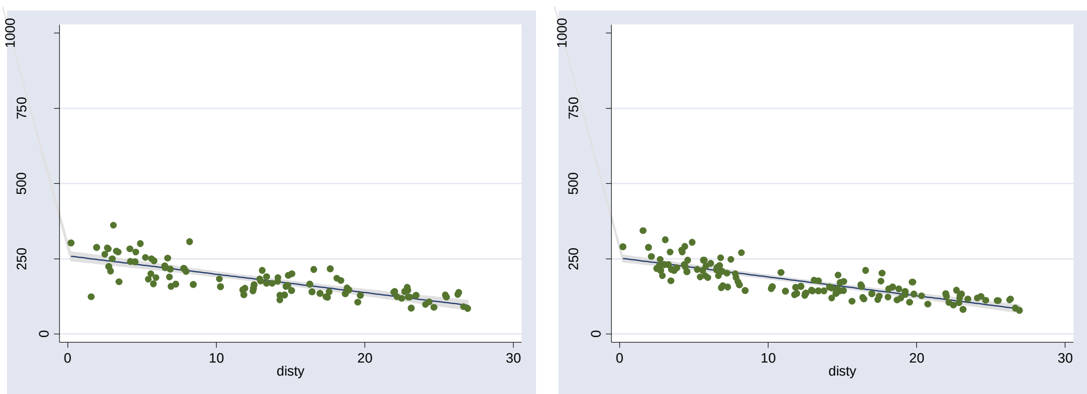


Figure 51 **Scatter plot of 4 bedroom apt price on distance to employment centre in JJ of Seoul**

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)



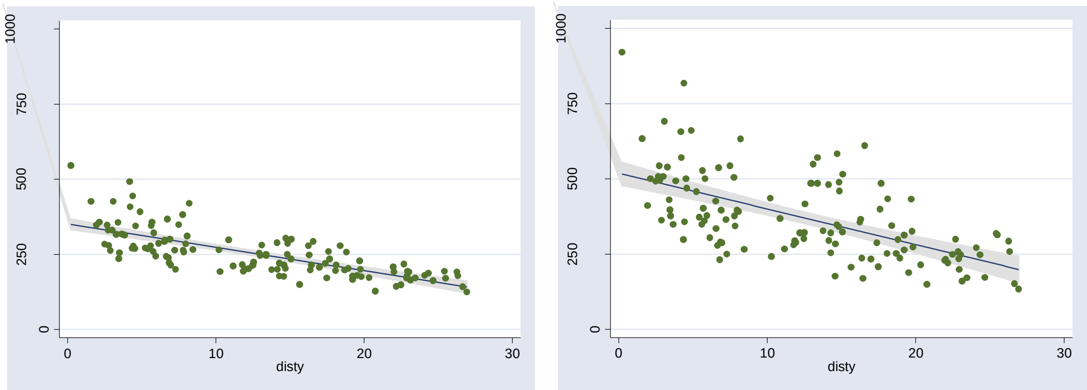


Figure 52 **Scatter plot of 4 bedroom apt price on distance to employment centre in YG of Seoul**

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

Several points can be observed from these diagrams.

First, the expected negative linear correlation between house prices and the distance to the city centre has been observed across all housing submarkets over time. Secondly, scatter plots by sectoral and spatial housing submarket show the same patterns of changes over time. The changes in gradients over time show little difference across different housing submarkets. However, the boundaries of each spatial housing submarket vary a little in size, as the radius of GS submarket is around 35 km, JJ is around 32 km, and YG is around 28 km. The degrees of changes in slopes of each submarket also vary. While the changes of slopes in JJ and YG submarkets are similar, the changes in GS submarket are more marked. The probable reasons will be discussed in the following section with comparative changes between submarkets. Thirdly, the gradients of the fitting lines get steeper over time. The changes between 2001 and 2004 are especially noticeable across all housing submarkets. This strongly indicates that there were external common factors influencing these changes in that period. Finally, the variance in apartment prices increased over time across all housing submarkets.

The results from the regression analysis of apartment price and the distance to the centre of each spatial housing submarket by sectoral housing submarket are summarised in the following tables.

Table 10 **OLS Regression of 2 bedroom apartment price on distance to employment centre in Seoul**

Submarket	year	Sample size	R^2	Coefficient of distance	Constant	5^{th} percentile*
GS (Price)	1998	116	0.6935	-6.04 (-16.06)	288 (45.35)	110
	2001	154	0.7082	-7.07 (-19.21)	297 (47.51)	100
	2004	154	0.6358	-13.9 (-16.29)	527 (36.37)	126
	2007	154	0.5764	-18.62 (-14.38)	695 (31.62)	138
JJ (Price)	1998	90	0.4898	-5.58 (-9.19)	250 (35.74)	110
	2001	121	0.5969	-5.39 (-13.28)	242 (42.43)	100
	2004	122	0.5749	-8.97 (-12.74)	365 (37.12)	126
	2007	121	0.4474	-11.41 (-9.81)	443 (27.27)	138
YG (Price)	1998	103	0.6079	-4.89 (-12.51)	232 (40.99)	110
	2001	130	0.6488	-5.18 (-15.38)	230 (45.88)	100
	2004	130	0.6082	-8.50 (-14.10)	355 (39.59)	126
	2007	130	0.4446	-11.42 (-10.12)	454 (27.07)	138

Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5^{th} percentiles are based on normal distribution in the whole market of Seoul

Table 11 **OLS Regression of 3 bedroom apartment price on distance to employment centre in Seoul**

Submarket	year	Sample size	R^2	Coefficient of distance	Constant	5^{th} percentile*
GS (Price)	1998	127	0.6292	-6.34 (-14.56)	312 (46.54)	120
	2001	154	0.6710	-7.10 (-17.61)	303 (44.46)	96
	2004	154	0.5815	-14.36 (-14.53)	543 (32.52)	124
	2007	154	0.5432	-21.60 (-13.44)	815 (30.01)	144
JJ (Price)	1998	90	0.3871	-5.61 (-7.46)	264 (33.04)	120
	2001	120	0.5631	-5.67 (-12.33)	246 (38.67)	96
	2004	122	0.5528	-9.36 (-12.18	370 (34.25)	124
	2007	122	0.4129	-13.01 (-9.19)	498 (25.05)	144
YG (Price)	1998	105	0.5798	-5.30 (-11.92)	253 (39.43)	120
	2001	129	0.6128	-5.05 (-14.18)	228 (42.83)	96
	2004	129	0.5155	-8.06 (-11.62)	352 (34.03)	124
	2007	129	0.3403	-12.47 (-8.09)	514 (22.36)	144

Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5^{th} percentiles are based on normal distribution in the whole market of Seoul

Table 12 OLS Regression of 4 bedroom apartment price on distance to employment centre in Seoul

Submarket	year	Sample size	R^2	Coefficient of distance	Constant	5th percentile*
GS (Price)	1998	110	0.6556	-8.47 (-14.34)	354 (36.00)	108
	2001	152	0.6857	-9.42 (-18.09)	358 (40.95)	108
	2004	152	0.6018	-14.67 (-15.06)	543 (33.23)	137
	2007	152	0.4712	-20.54 (-11.56)	804 (26.99)	155
JJ (Price)	1998	81	0.4227	-6.37 (-7.61)	286 (28.15)	108
	2001	119	0.5352	-6.50 (-11.61)	276 (35.81)	108
	2004	121	0.4984	-9.18 (-10.87)	380 (32.20)	137
	2007	121	0.3133	-11.75 (-7.37)	509 (22.83)	155
YG (Price)	1998	97	0.6119	-6.09 (-12.24)	260 (34.63)	108
	2001	127	0.6787	-6.26 (-16.25)	252 (45.00)	108
	2004	128	0.5469	-7.80 (-12.33)	351 (38.33)	137
	2007	128	0.3710	-11.9 (-8.62)	519 (25.98)	155

Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5th percentiles are based on normal distribution in the whole market of Seoul

A simple regression analysis of apartment price on the distance to the centre of each spatial housing submarket over time shows several characteristic points.

First, the variation in the distance to the centre of each spatial housing submarket explains about 55% of the variation of apartment price in each housing submarket in general. Nevertheless, there are some differences in detail. For example, its explanatory power decreases over time. It has the lowest values in 2007 as the variance in apartment price increases. The GS submarket shows a higher explanatory power than the other two submarkets and the 2 bedroom apartment market shows a higher explanatory power than the other two submarkets.

Second, sectoral submarkets have the similar level of gradients in each base year of 1998, 2001, 2004 and 2007. However, the gradients of the GS submarket are greater than the other two submarkets in each base year. On average, the gradients are around -6 in 1998, -6 in 2001, -9 in 2004, and -12 in 2007 in the JJ and YG submarkets, while the gradients are around -6 in 1998, -7 in 2001, -14 in 2004, and – 20 in 2007 in the GS submarket. The gradient of the GS submarket almost tripled whereas those for the JJ and YG submarkets have only doubled over 10 years.

The gradients have increased in a similar pattern throughout the period in all submarkets. The changes from 1998 to 2001 are not noticeable while the changes from 2001 to 2004 and from 2004 to 2007 are quite significant.

The coefficients of constant have similar values over time across all sectoral housing submarkets. In the same manner as the gradients, however, GS submarket has a higher level of constants than JJ and YG submarkets which show very similar values over time.

Finally, the coefficients of constant have a similar pattern of changes across all sectoral housing submarkets. Like the pattern of changes in gradients, the changes of constants from 2001 to 2004 and from 2004 to 2007 are far more significant than the changes from 1998 to 2001. The pattern of changes in the 5th percentiles shows the same trend over time although the values vary slightly by sectoral housing markets. The 5th percentiles declined from 1998 to 2001 then gradually increased over time.

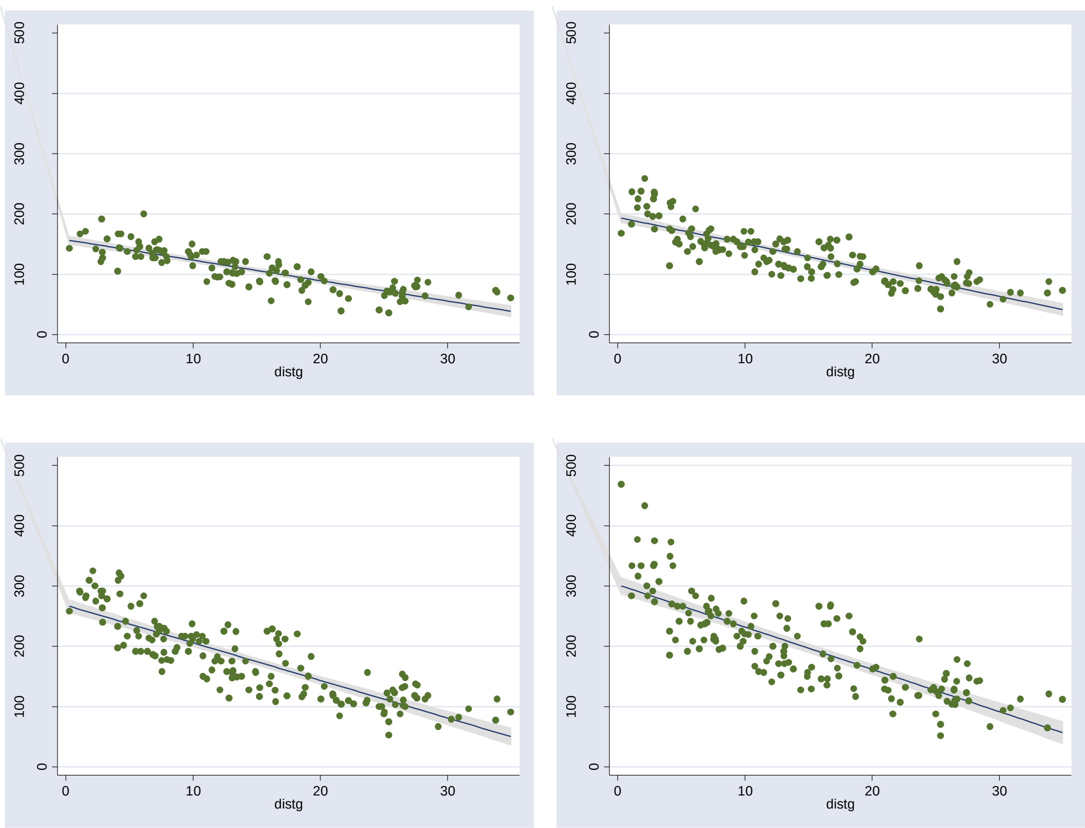


Figure 53 **Scatter plot of 2 bedroom apt rent on distance to employment centre in GS of Seoul**

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

The second analysis is the regression of the rates of apartment rent on the distance to the centre of each spatial housing submarket. This analysis is expected to be more accurate than that using price data, as rent data reflecting actural residential demand is less influenced by some 'noise' factors that influence price data, such as speculative investments. The regression analysis is conducted using the three spatial housing submarkets and the three sectoral housing submarkets, in the same way as the analysis of the price data. A total of 402 sample apartment complexes for 2 bedroom apartments, 402 for 3 bedroom apartments, and 397 for 4 bedroom apartments, are used for the analysis. The sample apartment complexes are also analysed the same as the analysis using price data. Scatter plots, regression fit lines, and 95% confidence intervals of the three main spatial housing submarkets in the Seoul Metropolitan Area have been drawn by year, between 1998 and 2007, in the following diagrams. The statistical results from the regression of R^2, coefficients, t-values, and 5^{th} percentiles can be seen in the tables.

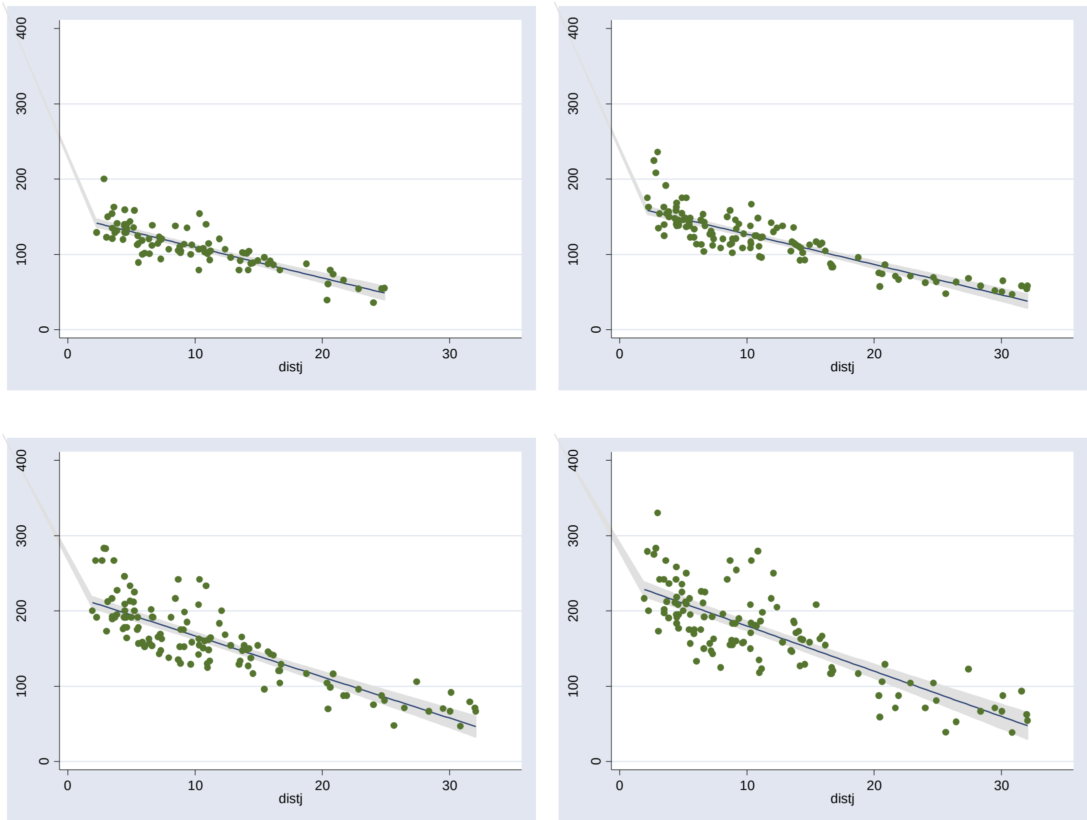


Figure 54 **Scatter plot of 2 bedroom apt rent on distance to employment centre in JJ of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)**

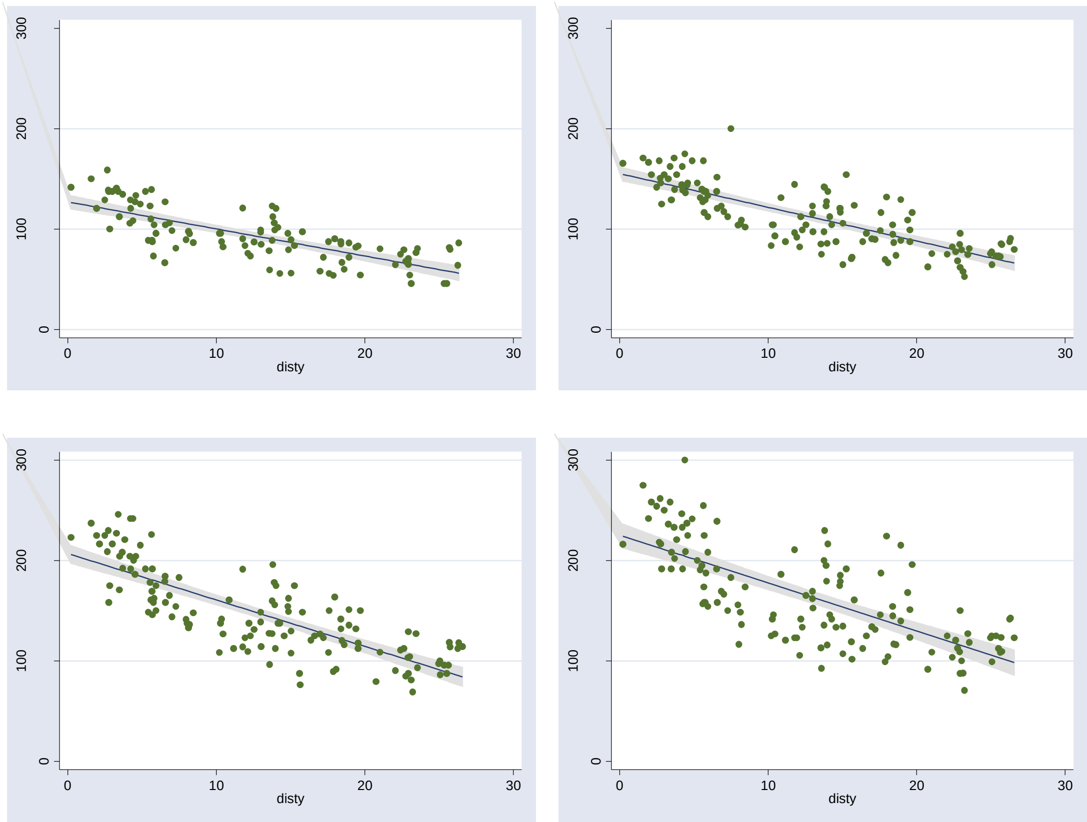
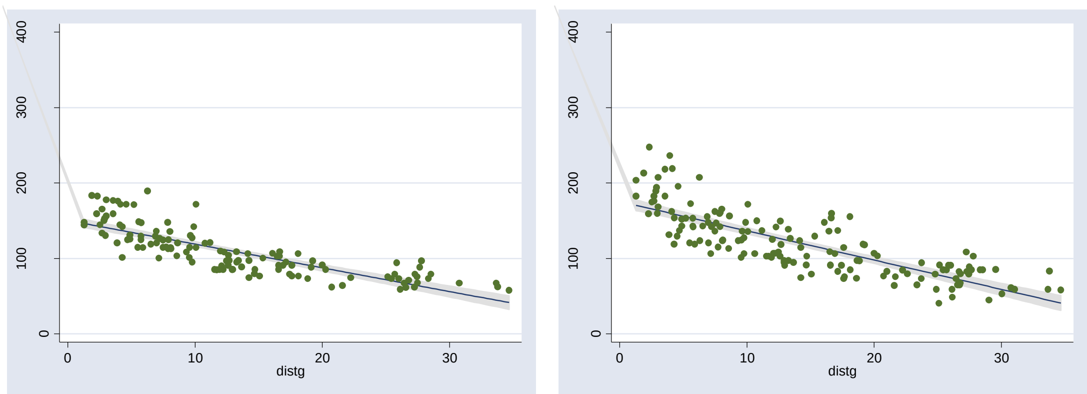


Figure 55 **Scatter plot of 2 bedroom apt rent on distance to employment centre in YG of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)**



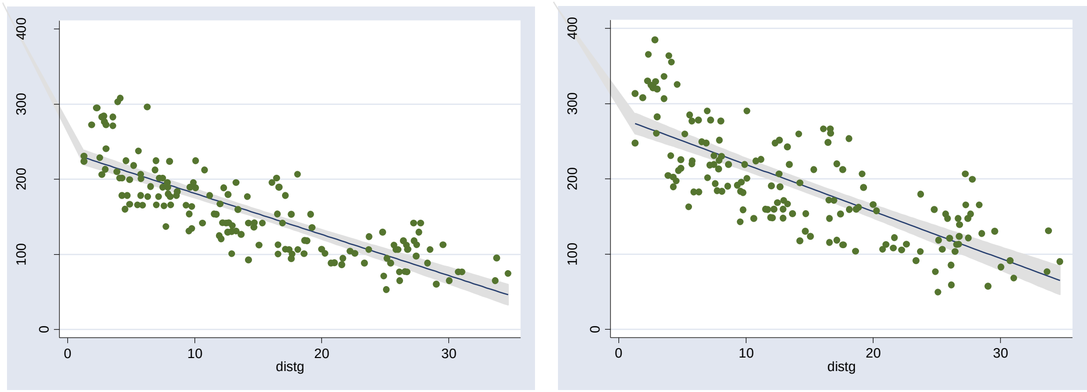


Figure 56 **Scatter plot of 3 bedroom apt rent on distance to employment centre in GS of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)**

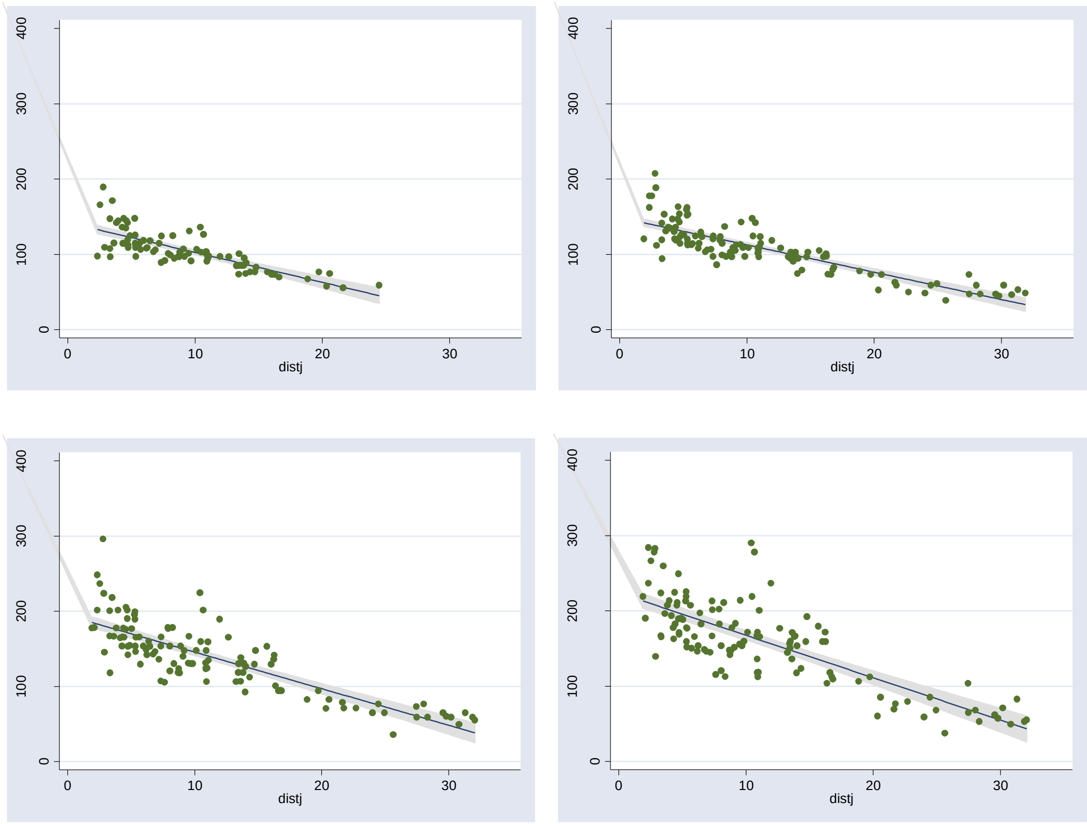


Figure 57 **Scatter plot of 3 bedroom apt rent on distance to employment centre in JJ of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)**

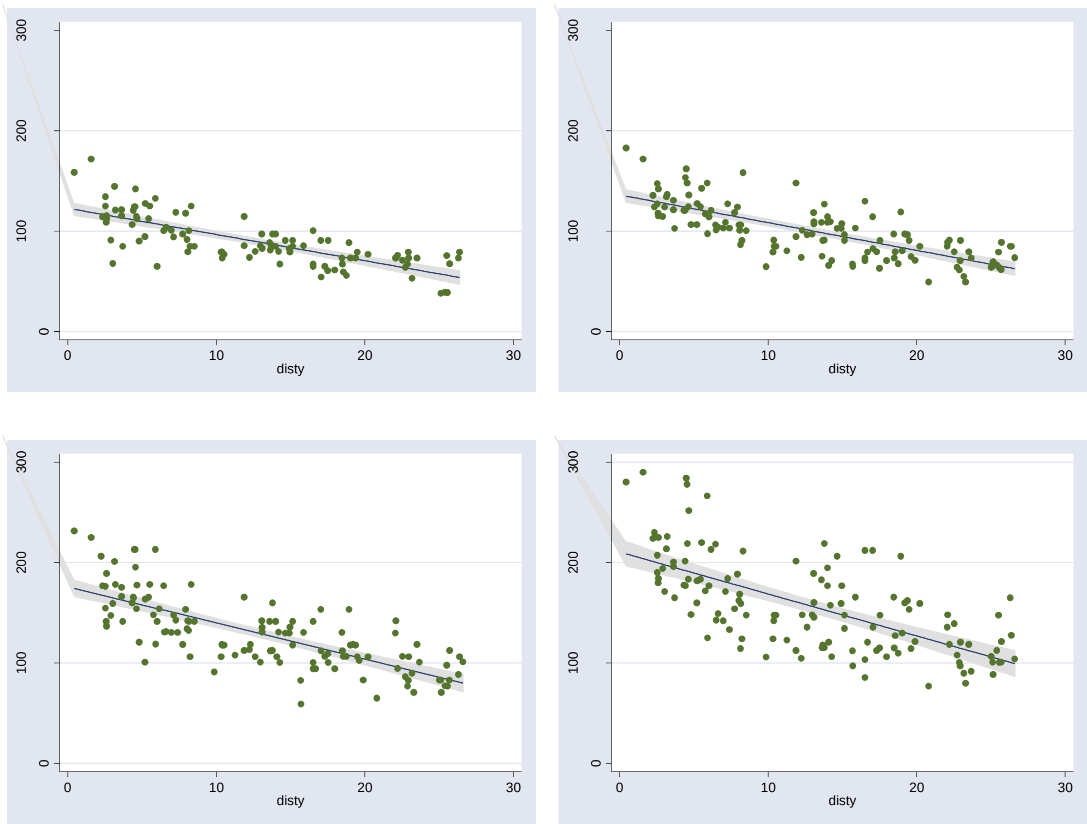
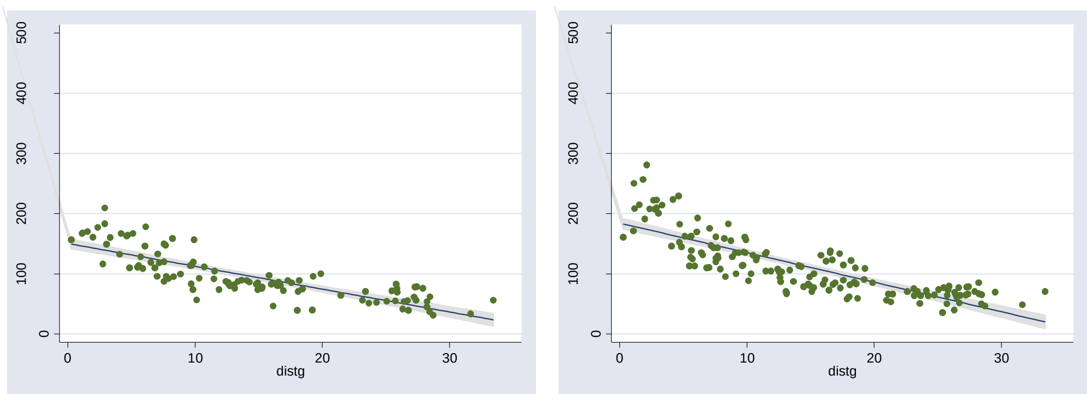


Figure 58 **Scatter plot of 3 bedroom apt rent on distance to employment centre in YG of Seoul**

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)



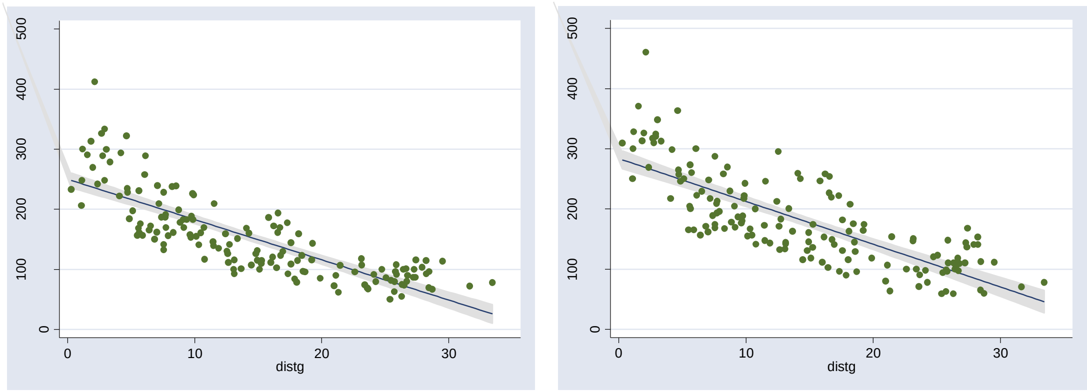


Figure 59 Scatter plot of 4 bedroom apt rent on distance to employment centre in GS of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

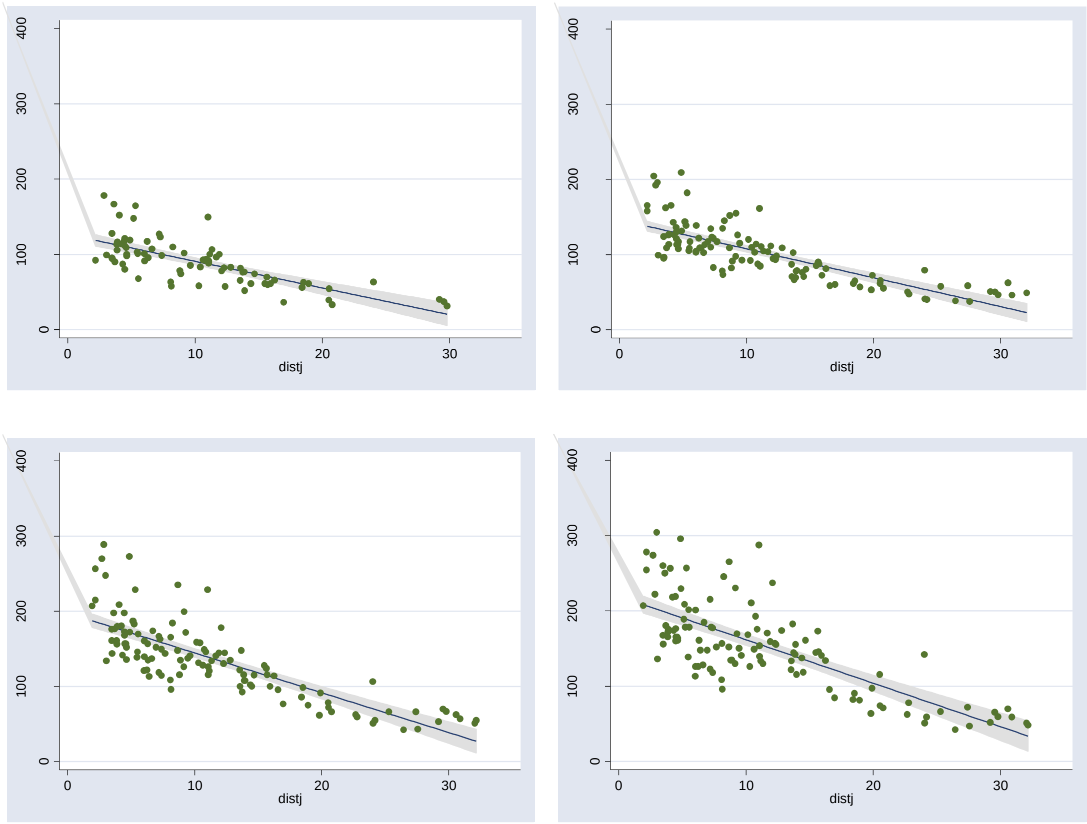


Figure 60 Scatter plot of 4 bedroom apt rent on distance to employment centre in JJ of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

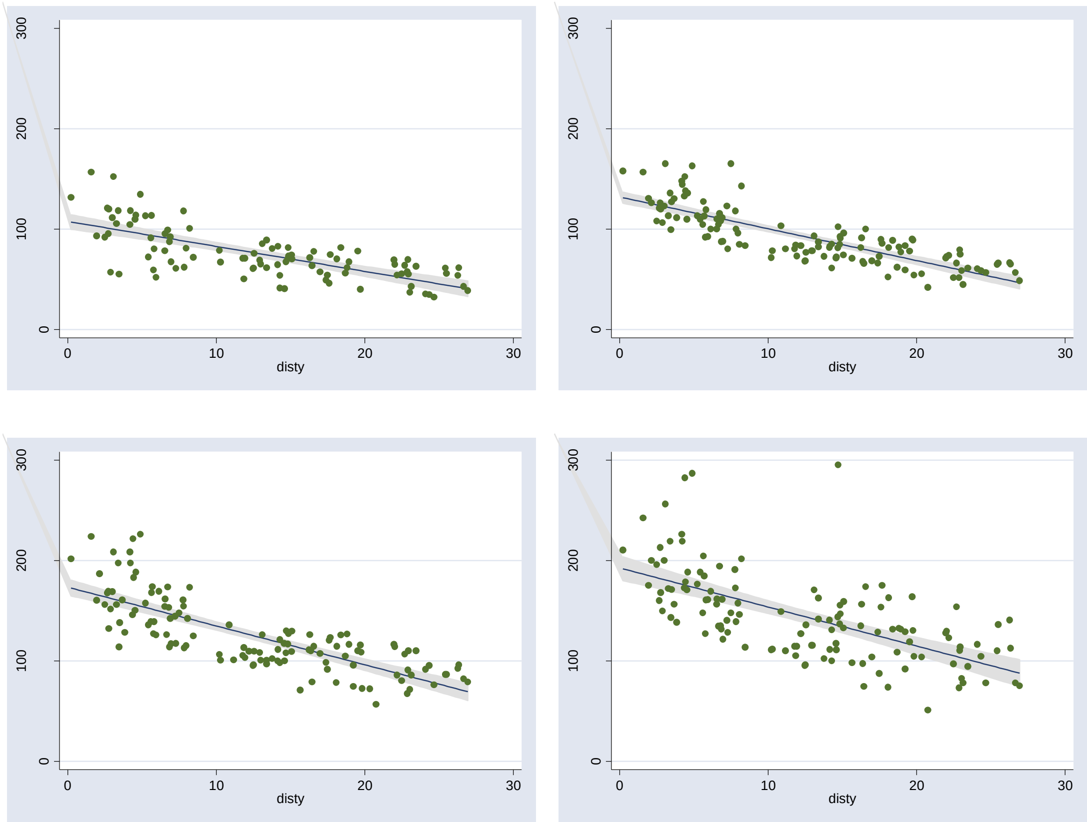


Figure 61 **Scatter plot of 4 bedroom apt rent on distance to employment centre in YG of Seoul (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)**

Several points can be observed from these diagrams. Firstly, the traditional negative linear correlation between rent and the distance to the town centre has been verified across all housing submarkets over time. Second, scatter plots by sectoral and spatial housing submarket show the same patterns of changes over time. The changes in gradients over time show little difference by housing submarkets. The boundaries of each spatial housing submarkets vary a little, the same as the price data. The degrees of changes in the slopes of each submarket are similar, regardless of spatial housing submarkets. This may be due to the fact that there is no speculative factor in rent data. Third, the gradient of the fitting line also get steeper over time. Although the degree of the pattern of changes is more gradual than in the price data, it also demonstrates more changes in the period between 2001 and 2004. These greater changes in price data might indicate that price data is more sensitive to external changes, such as the commuting cost changes caused by an increase in oil price, as price data includes all capitalised rents in the future. Finally, the variance in apartment rent has increased over time across all housing submarkets too. The results from the regression analysis of apartment rent and the distance to the centre of each spatial housing submarket are summarised in the following tables.

Simple regressions of apartment rent on the distance to the centre of each spatial housing submarket across sectoral housing submarkets over time show several characteristic points.

First, the variation in the distance to the centres explains about 63% of the variation of apartment rent in each housing submarket in general, which is greater than the figure using price data. This suggests that rent is more strongly correlated with accessibility than price. The explanatory power decreases over time. It has the lowest values in 2007 as variance in apartment rents increases. The GS submarket shows a higher explanatory power than the other two submarkets and the sectoral housing submarket of 2 bedroom apartments shows a higher explanatory power than other two submarkets.

Second, sectoral submarkets have a similar level of gradients in each base year of 1998, 2001, 2004 and 2007. The gradients by spatial submarkets also show a similar level over time. The gradients have also increased in similar pattern over the years across all submarkets. The changes

Table 13 OLS Regression of 2 bedroom apartment rent on distance to employment centre in Seoul

Submarket	year	Sample size	R^2	Coefficient of distance	Constant	5^{th} percentile*
GS (Rent)	1998	116	0.7120	-3.39 (-16.79)	157 (46.18)	54
	2001	154	0.7225	-4.37 (-19.90)	194 (52.16)	63
	2004	154	0.7238	-6.23 (-19.96)	268 (50.62)	77
	2007	154	0.6571	-7.02 (-17.07)	302 (43.30)	72
JJ (Rent)	1998	90	0.6921	-4.1 (-14.06)	151 (44.88)	54
	2001	121	0.7420	-4.03 (-18.50)	167 (54.70)	63
	2004	122	0.7056	-5.47 (-16.96)	222 (49.23)	77
	2007	121	0.6425	-6.01 (-14.62)	240 (41.77)	72
YG (Rent)	1998	103	0.5646	-2.70 (-11.44)	127 (37.32)	54
	2001	130	0.6211	-3.35 (-14.48)	155 (45.12)	63
	2004	130	0.6422	-4.63 (-15.16)	207 (45.62)	77
	2007	130	0.5165	-4.78 (-11.69)	225 (37.08)	72

Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5^{th} percentiles are based on normal distribution in the whole market of Seoul

Table 14 **OLS Regression of 3 bedroom apartment rent on distance to employment centre in Seoul**

Submarket	year	Sample size	R^2	Coefficient of distance	Constant	5^{th} percentile*
GS (Rent)	1998	128	0.6674	-3.14 (-15.90)	150 (49.08)	60
	2001	154	0.6537	-3.88 (-16.94)	175 (45.32)	59
	2004	154	0.6679	-5.47 (-17.48)	236 (44.62)	71
	2007	154	0.5756	-6.25 (-14.36)	282 (38.32)	78
JJ (Rent)	1998	90	0.6205	-3.97 (-11.99)	142 (40.49)	60
	2001	120	0.7232	-3.63 (-17.56)	149 (51.97)	59
	2004	122	0.6858	-4.88 (-16.90)	194 (45.96)	71
	2007	122	0.6256	-5.63 (-14.16)	224 (40.06)	78
YG (Rent)	1998	105	0.5853	-2.61 (-12.06)	123 (39.32)	60
	2001	129	0.5642	-2.76 (-12.82)	136 (42.34)	59
	2004	129	0.5618	-3.60 (-12.76)	176 (41.77)	71
	2007	129	0.4407	-4.17 (-10.00)	211 (33.81)	78

Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5^{th} percentiles are based on normal distribution in the whole market of Seoul

Table 15 **OLS Regression of 4 bedroom apartment rent on distance to employment centre in Seoul**

Submarket	year	Sample size	R^2	Coefficient of distance	Constant	5^{th} percentile*
GS (Rent)	1998	110	0.6744	-3.79 (-14.96)	150 (35.64)	40
	2001	152	0.6793	-4.91 (-17.83)	184 (39.89)	51
	2004	152	0.6665	-6.70 (-17.31)	250 (38.51)	68
	2007	152	0.6137	-7.11 (-15.44)	284 (36.74)	71
JJ (Rent)	1998	81	0.5407	-3.55 (-9.64)	126 (28.35)	40
	2001	119	0.6227	-3.84 (-13.90)	146 (38.38)	51
	2004	121	0.6444	-5.30 (-14.68)	198 (39.20)	68
	2007	121	0.5687	-5.77 (-12.53)	219 (34.09)	71
YG (Rent)	1998	97	0.5152	-2.49 (-10.05)	108 (28.88)	40
	2001	127	0.6645	-3.17 (-15.74)	132 (45.11)	51
	2004	128	0.6057	-3.86 (-13.91)	174 (43.07)	68
	2007	128	0.4031	-3.89 (-9.22)	193 (31.51)	71

Values in parentheses are t-values
Coefficients and constants are all statistically significant at 0.1% level
* 5^{th} percentiles are based on normal distribution in the whole market of Seoul

from 2001 to 2004 are the most noticeable changes all over the periods. These unified trends could be another reason why the rent data is a better data set than unit price in analysing the structure of the housing market.

Third, the constants also demonstrate similar values by time across all sectoral housing submarkets. In contrast to the patterns in gradients, however, the GS submarket has a higher level of constants than the JJ and YG submarkets, which show very similar values over time.

Fourth, the constants have similar patterns of changes across sectoral housing submarkets. Like the pattern of changes in gradients, the changes from 2001 to 2004 are more significant than the changes from 1998 to 2001 and from 2004 to 2007.

Fifth, the pattern of changes in the 5th percentile shows the same trend over time, although its values vary slightly by sectoral housing market. In contrast to the result from apartment price, the 5th percentile has gradually increased over time without fall.

These characteristics of changes can be interpreted with an understanding of the dynamic changes of land rents in the following section.

6-5-3 Dynamic changes of differential rent & absolute rent

This section uses the coefficients of the regression analysis for further analysis as they are useful to figure out dynamic changes of land rents in housing market. Firstly, the coefficients of accessibility to centres can be understood as the gradient of the contribution of differential rent to the variance of price and rent of house. Secondly, the constants can be understood as the heights of the base of the cone of house prices. Thirdly, 5th percentiles[83] can be regarded as minimum level of house price in a given time in a certain sectoral housing submarket, which reflects the level of absolute rent in each sectoral housing submarket. The boundary of a spatial housing submarket then can be deduced from the combined use of the coefficients of accessibility to centres, the constants and 5th percentiles of house price.

Based on these data of coefficients and 5th percentiles, the structure of apartment price and rent in Seoul over time has been drawn. Residuals from sampling, extreme values, and other various factors affecting actual contracts of transactions of house are all making it difficult to find the underlying trend of price of house. Moreover, there are many factors affecting house

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[83] See footnote 71.

price such as construction costs and speculative expectation on future prices other than capitalised land rents. A substitution effect between house buying and renting also makes it difficult to simply regard house price as a capitalised rent. Nevertheless, the lines of house price by housing submarket over time in the following diagrams can be a starting point for the proper analysis to reveal the structure and dynamic movements of land rents in urban area. Forsimplicity, accessibility factor in house price which reflects differential rent will be called DR proxy and the 5th percentile of house price which reflects absolute rent will be called AR proxy hereafter.

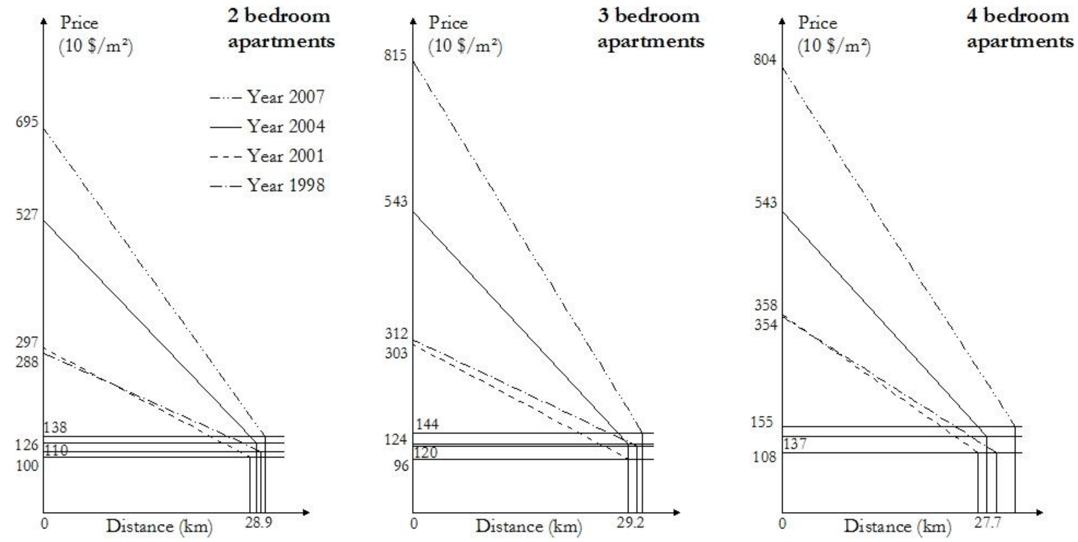

Figure 62 Changes of DR and AR proxies of apartment price in Seoul (GS)

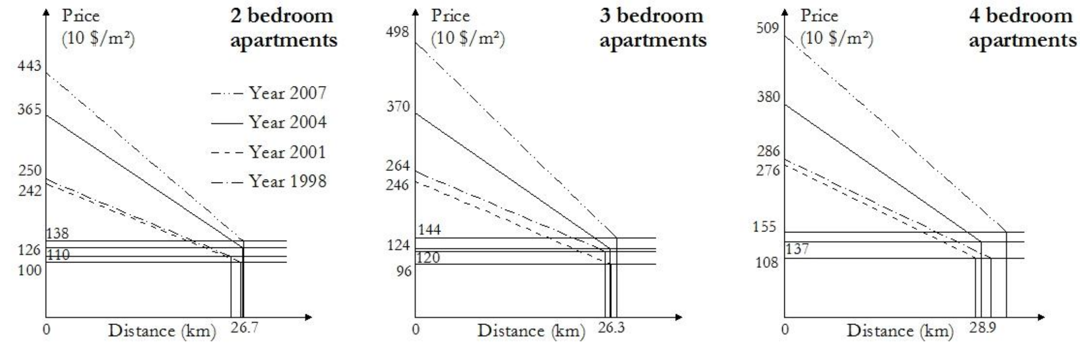

Figure 63 Changes of DR and AR proxies of apartment price in Seoul (JJ)

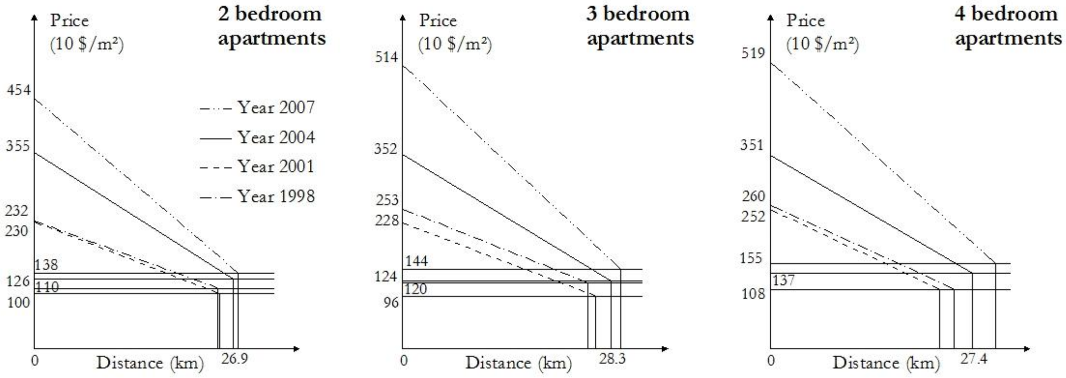

Figure 64 Changes of DR and AR proxies of apartment price in Seoul (YG)

These 9 diagrams show the changes in DR and AR proxies over time by sectoral housing submarkets of 2 bedroom, 3 bedroom, and 4 bedroom apartments and by the spatial housing submarkets of GS, JJ, and YG in Seoul (see Table 10, 11 and 12). These diagrams of changes of prices of apartments over time imply various points.

First, the gradients of DR proxies in all sectoral and spatial housing submarkets show a similar pattern of changes. There were no significant changes in gradients between 1998 and 2001 in any submarket, which implies that there was no significant change in DR proxies such as commuting costs. The changes of the position of DR proxies in the period are rather due to the fall in AR proxies in the period. However, the changes from 2001 to 2004 and from 2004 to 2007 in all submarkets show some degree of significance as the gradients get steeper with shifts outwards. As DR reflects an advantage to live closer to the centre of employment, this pattern of changes can be interpreted that costs of commuting have been increased or what people will pay for the benefits from living closer to the central area has increased. For the same period, international price of crude oil has started to significantly increase from 2002[84]. This might be reflected in the changes of DR proxies in the period. The shift of the DR proxies line outwards implies that there was an expansion of each spatial housing market in that period.[85] These facts may explain the changes of DR proxies of apartment price in Seoul during the period.

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84 Source: IMF, 'monthly primary commodity prices'

85 Commuting area of Seoul has expanded by the construction of 'new towns' around Seoul. In 1990s, the first generation of new towns including IlSan, BunDang, JoongDong, SanBon, and PyungChon have widened the actual commuting distances to employment centres in Seoul. In 2000s, the second generation of new towns of PaJoo, GimPo, YangJoo, PanGyo, and GwangGyo are being built resulting in a further

Table 16 Changes of AR proxies of apartment price in Seoul

Year	2 bedroom apt.		3 bedroom apt.		4 bedroom apt.	
	AR proxies	change	AR proxies	Change	AR proxies	change
1998	110		120		108	
2001	100	- 10 %	96	- 20 %	108	0 %
2004	126	+ 26 %	124	+ 29 %	137	+ 27 %
2007	138	+ 10 %	144	+ 16 %	155	+ 13 %

Secondly, the levels of AR attributes showed similar patterns of changes across all submarkets over time. The slight difference in these patterns is that the AR attributes of 4 bedroom apartments remain the same from 1998 to 2001, whereas those of 2 bedroom and 3 bedroom apartments have fallen by around 10% and 20% respectively. The changes in AR attributes since 2001, however, show the same pattern across all submarkets. The AR attributes of the three sectoral housing submarkets bounced up substantially by 26%, 29%, and 27% respectively. This increase has continued in the next period by 10%, 16%, and 13% respectively. The decrease of AR attributes from 1998 to 2001 was substantially influenced by the Asian economic crisis in 1997. Actual purchasing power and available investments for properties had significantly declined and interest rates increased in the following years. These would contribute to the fall of AR attributes of price by reducing speculative factors. The changes in AR attributes of rent in the same period can reveal the structure of the minimum level of price of sectoral housing submarket. This will be discussed in the following analysis using rent data. The increase of 5th percentiles from 2001 implies that AR attributes increased as the growth in demand chronically exceeded supply of housing across all sectoral housing submarkets, even considering a revival of speculative investments and inflation. This can be supported by the following analysis with apartment rent.

Thirdly, the pressure for redevelopment force varies by sectoral housing submarket and locations. The AR attributes of the sectoral housing submarkets have changed in a similar pattern. However, the AR attributes for 4 bedroom apartments are slightly greater than the other two groups since 2001, which implies that to build 4 bedroom apartments can be more profitable than the other two types of apartment analysed in Seoul. Thus, in general, incentives for redevelopment for the sectoral housing submarket of 4 bedroom apartments are greater than for

expansion of the commuting area of Seoul.

the other two types of apartment in Seoul. The pressure on space for redevelopments keeps changing over time. Particularly, as the slopes of DR attributes get steeper over time, the central areas demonstrate a bigger pressure for redevelopments than outer areas.

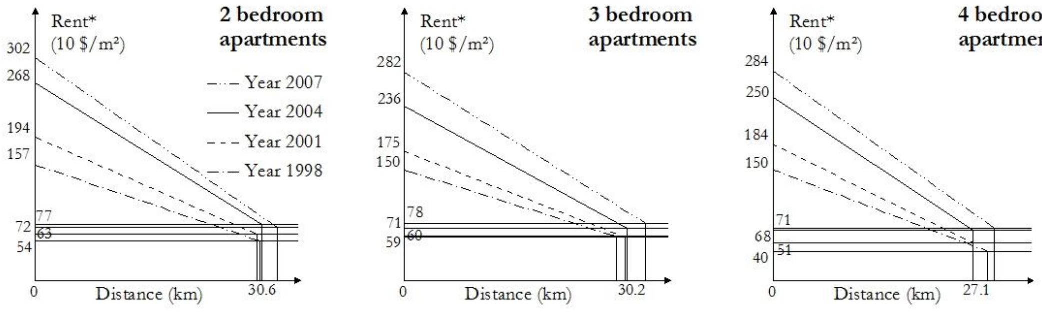

Figure 65 Changes of DR and AR proxies of apartment rent in Seoul (GS)

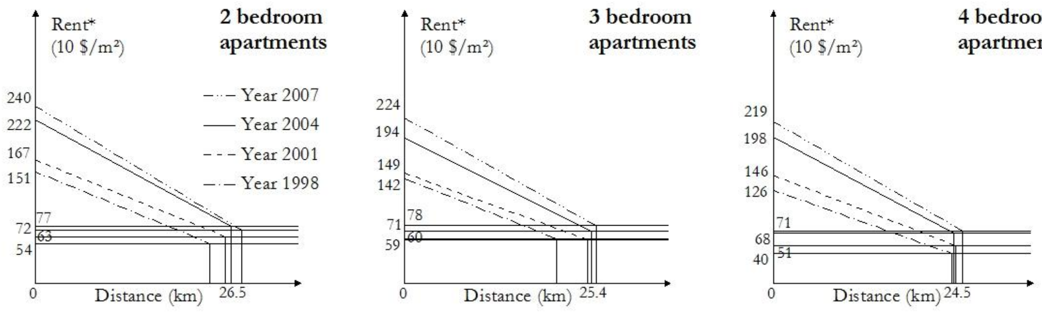

Figure 66 Changes of DR and AR proxies of apartment rent in Seoul (JJ)

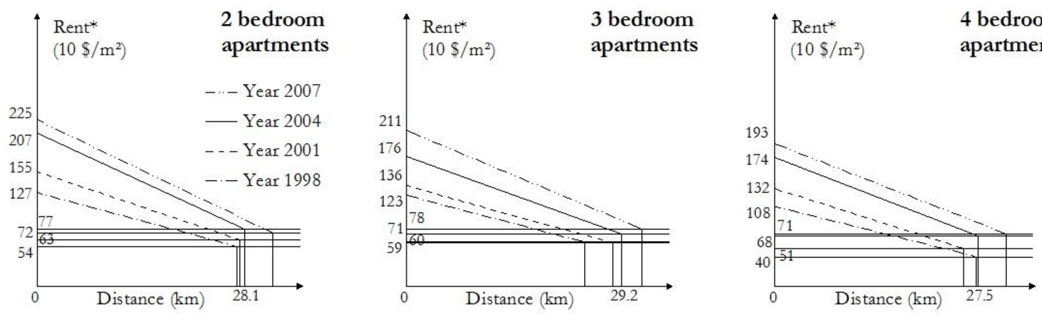

Figure 67 Changes of DR and AR proxies of apartment rent in Seoul (YG)

These 9 diagrams show the changes in DR and AR proxies over time by sectoral housing submarkets of 2 bedroom, 3 bedroom, and 4 bedroom apartments and by the spatial housing submarkets of GS, JJ, and YG in Seoul. These diagrams of the changes of rent of apartments imply various points in the comparison with those of prices.

First, the gradients of DR attributes in all sectoral and spatial housing submarkets show a similar pattern of changes over time. As opposed to the decline of DR attributes in apartment price from 1998 to 2001, the DR attributes in apartment rent in the same period increased. The changes from 2001 to 2004 are led by the steepening of the gradients rather than an expansion in DR attributes. The changes from 2004 to 2007 are again led by an expansion in DR attributes. The difference between the changes of DR attributes in apartment price and apartment rent from 1998 to 2001 can be interpreted in various ways. One of them is the opposing movements of 5th percentiles in apartment price and apartment rent, which will be discussed later. The changes in the following periods from 2001 to 2007 are almost same as the pattern of changes of DR attributes in apartment price. Thus an increase in commuting costs by soaring oil prices or congestion can be the underlying causes of the changes.

Table 17 Changes of AR proxies of apartment rent in Seoul

Year	2 bedroom apt.		3 bedroom apt.		4 bedroom apt.	
	AR proxies	change	AR proxies	Change	AR proxies	change
1998	54		60		40	
2001	63	+ 17 %	59	- 2 %	51	+ 28 %
2004	77	+ 22 %	71	+ 20 %	68	+ 33 %
2007	72	- 6 %	78	+ 10 %	71	+ 4 %

Secondly, the levels of AR attributes show various patterns of changes by submarkets over time. The AR attributes of 3 bedroom apartments have fallen by 2% from 1998 to 2001, whereas those of 2 bedroom and 4 bedroom apartments rose by 17% and 28% respectively. The AR attributes of all sectoral housing submarkets from 2001 to 2004 increased more than 20%. In the last period from 2004 to 2007, the AR attributes of 2 bedroom apartments fell, while those of 3 bedroom and 4 bedroom continued to increase by 10% and 4% respectively. With AR attributes of apartment price and apartment rent, the relationship between the sales market and renting market can be construed. With the AR attributes by sectoral housing submarket, the combined movements of relative preference for demand and supply of housing in each submarket can be construed. The fact that AR attributes in apartment rent from 1998 to 2001 have increased in general, while those in price have fallen during the same period, implies that 1) effective demand for living in apartments increased despite the diminution in purchasing power, due to the economic crisis in that period, 2) the level of rent increased, as demand for property buying turned to demand for renting because of the substitution effect between the two. The relatively significant fall of AR attributes of the sectoral housing submarket of 3 bedroom apartments from 1998 to 2001, compared to the other two submarkets, implies that there might have been a large supply of 3 bedroom apartments in the period in both of sales and renting market. The increase of 5th percentiles from 2001 to 2004 in both apartment price and rent may be explained by the fact that AR attributes increased, as the growth in demand exceeded the supply of housing across all sectoral housing submarkets in the period, even considering the revival of speculative investments and inflation. These increases in AR attributes slowed in the period from 2004 to 2007. The AR attributes in 2 bedroom apartments in rent decreased in the period. Taking inflation into account, in general, these changes in AR attributes in rent from 2004 to 2007 imply that there was a considerable degree of stability in the market condition of supply and demand of renting stock, despite decline of rent levels in the 2 bedroom apartment. However, as opposed to this fall in rent levels, the AR attributes of apartment price increased more than 10% across all submarkets in the same period. This was likely due to the multiple policies undertaken by the Korean government[86] to boost the real estate market in the period. Considering the gentle increase in rent, the higher increase of apartment prices across the sectoral submarkets may have to suffer from readjustment of the market in the future.[87]

Finally, the pressure for redevelopment varies across sectoral housing submarkets and locations. However, the pattern of the pressure is exactly opposite to that of apartment price. Rent data demonstrates that the AR attributes for 4 bedroom apartments are the lowest in the sectoral housing submarkets, while 4 bedroom apartments are the most preferable submarket in terms of apartment price. This implies that, in the current market, 4 bedroom apartments are the most valuable type in terms of sales but the most unattractive type in terms of renting among the three types in Seoul. However, in the long run, the preference for 4 bedroom apartments would be reduced, as rent data demonstrates more fundamental movements of property market. In actual fact, the fall in price of 4 bedroom apartments has been the most significant among the three groups in the recent recession in real estate markets in Korea.[88]

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[86] The government have promoted multiple development plans of new cities in outer regions from 2003. In the process, huge amount of compensated money for land for the new cities has re-invested in real estate market in Seoul. This has stimulated the speculative demand for buying apartment resulting in the increase in apartment price.

[87] In effect, since 2009, the real estate market in Korea has been suffering from the fall in price and decreasing transactions.

[88] In the downturn in real estate market in Korea, properties of larger floor area are experiencing greater

Just like the pattern of changes in apartment price, the slopes of DR attributes get steeper over time. This would make central areas exposed to heavier pressure for redevelopment than outer areas over time.

The diagrams of DR and AR proxies can be applied in order to investigate the interaction and changes of borders between spatial housing submarkets[89]. The following six diagrams show the interactions and change of borders between 1) JJ and GS submarket, 2) JJ and YG submarket, and 3) YG and GS submarket in terms of apartment rent and price. Ther first two diagrams are those between JJ and GS submarket.

JJ is a spatial submarket where the old town centre of JongRo is located while GS is a spatial submarket where the most recently developed town centre of GangNam is located. Although GangNam and the spatial submarket surrounding it have been developed only since the 1970s, its speed of growth exceeds that of others[90]. In 1998, the starting point of this study, GS submarket is ahead of JJ in dominance. The border between the two is closer to centre of JJ. This dominance of GS over JJ continued after 1998. As a result of the increasing dominance of GS, the border between the two has been getting closer to the centre of JJ. Even in 2007, the two spatial submarkets are merged into one in terms of apartment rent.

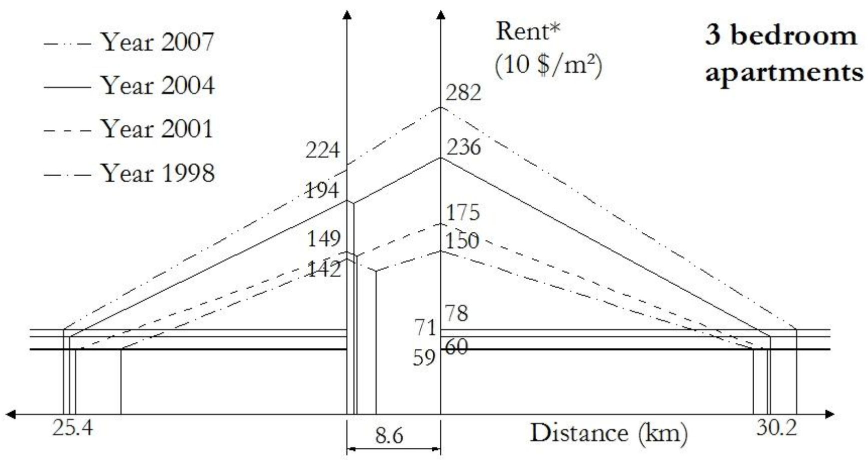

Figure 68 Changes of DR and AR proxies of apartment rent in Seoul (JJ-GS)

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drop in the level of price.

89 For the interaction between multiple spatial housing submarkets, see section 4-2-2

90 See appendix 6-8

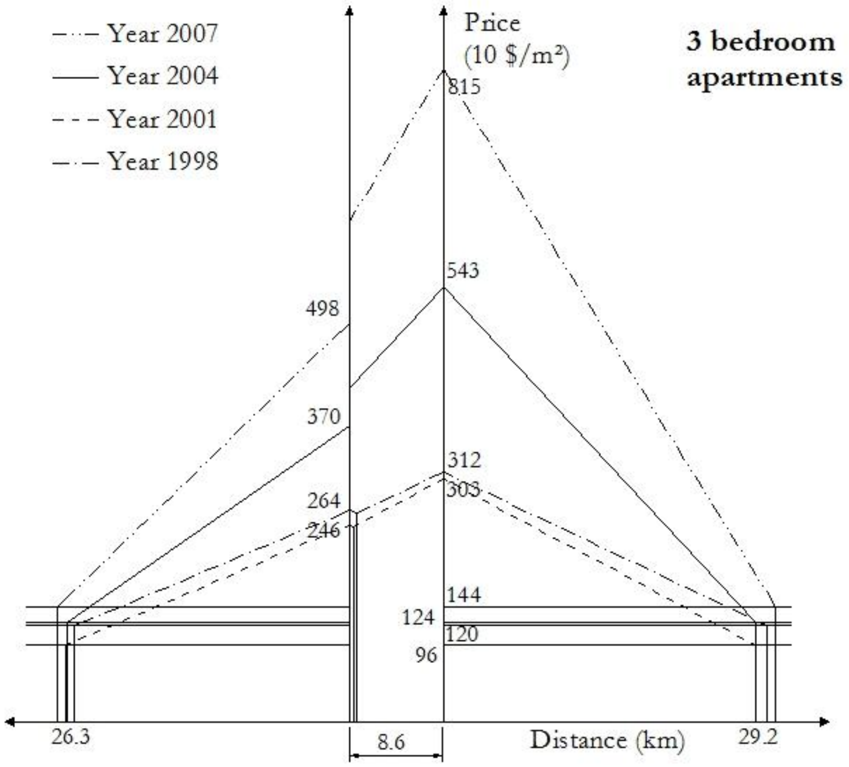

Figure 69 Changes of DR and AR proxies of apartment price in Seoul (JJ-GS)

Undertaking the same analysis using price data indicates an interesting point. Although the pattern of changes in borders is the same as those with rent data, the timing of the merging of the two spatial submarkets is different. The two spatial submarkets of JJ and GS are merged in 2004 in price data, whereas they are still separated in 2004 in rent data. This can be explained using the characteristics of price data. As price data reflects expectations on the future value of properties, this earlier merging in price can be interpreted as demonstrating that expectations of people on the interactions between the two markets in the future are reflected in apartment price prior to actual changes in the status of the current market.

As the main factor to the variance of DR is commuting, this merging would continue as long as the employment growth of GS exceeded JJ. An overturn of the change in the employment growth might separate it into two spatial submarkets again. In a completely merged situation, analysis of the housing market would be conducted treating the data as one spatial housing market, as in the case of London. For example, in a situation where two spatial submarkets are merged into one, accessibility to the centre should be the distance to the centre of the merging submarket (in this case GS); it would be inappropriate to use two variables of distances to the centre of the merged (JJ) and the merging submarket (GS) as two separated markets. There have been many studies which have highlighted the declining importance of accessibility to the centre of a city. However, these arguments should be re-examined. One of the most typical errors is to assume the centre of a city as the old town centre. However, if other centres have grown enough to form independent peaks and attract incoming commutes, they should be analysed as separated spatial submarkets of their own centres of employment. If the new town centres has grown and dominated old centres, accessibility to old town centre would have little significance, which is against the traditional model in the whole housing market. If submarkets are independent like JJ and GS in 1998, they need to be analysed separately, with different levels of accessibility to each centres. If a new submarket merged into an old town centre like GS over JJ in 2007, the accessibility variable should be the accessibility to the centre of GS, not the centre of JJ.

An appropriate subdivision of spatial housing submarkets would reveal the strong negative relationship between house price and the distance to the centre of a city. This has been proved throughout this study.

The next two diagrams show the interactions and changes in borders between JJ and YG submarkets over time.

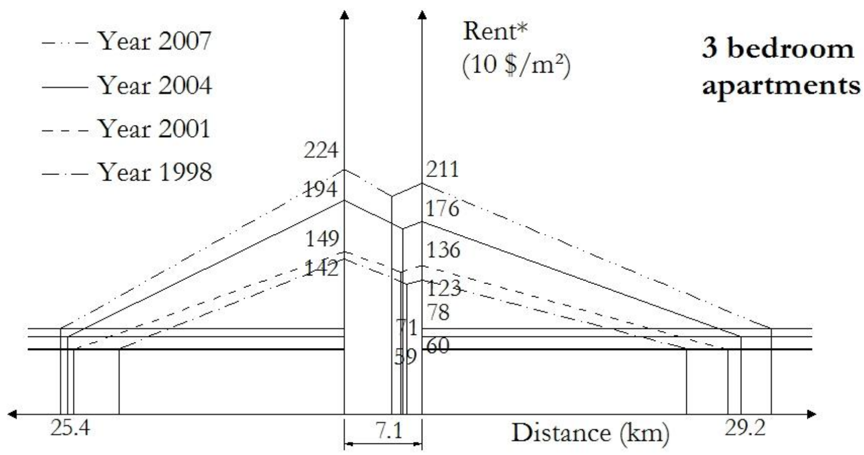

Figure 70 Changes of DR and AR proxies of apartment rent in Seoul (JJ-YG)

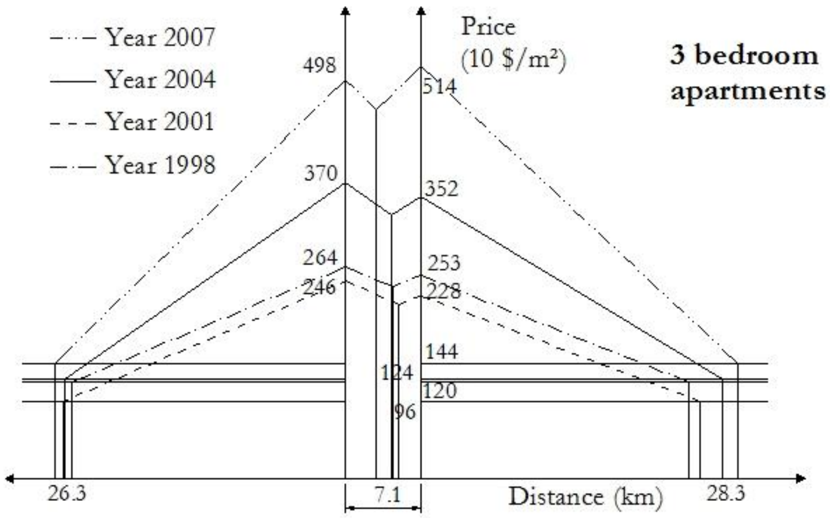

Figure 71 Changes of DR and AR proxies of apartment price in Seoul (JJ-YG)

In 1998, JJ is more dominant than YG. Since then, however, the dominance of the JJ submarket over YG decreased. With rent data, in 2007, the JJ submarket still holds its dominance over YG. However, with price data, YG acquired dominance over the JJ submarket. Although in both cases the two are not merged yet, the levels of dominance are different in 2007. As explained, this difference can be explained with characteristics of price data. From the analysis of both price and rent data, it can be said that people in the market expect the growing dominance of YG in near future.

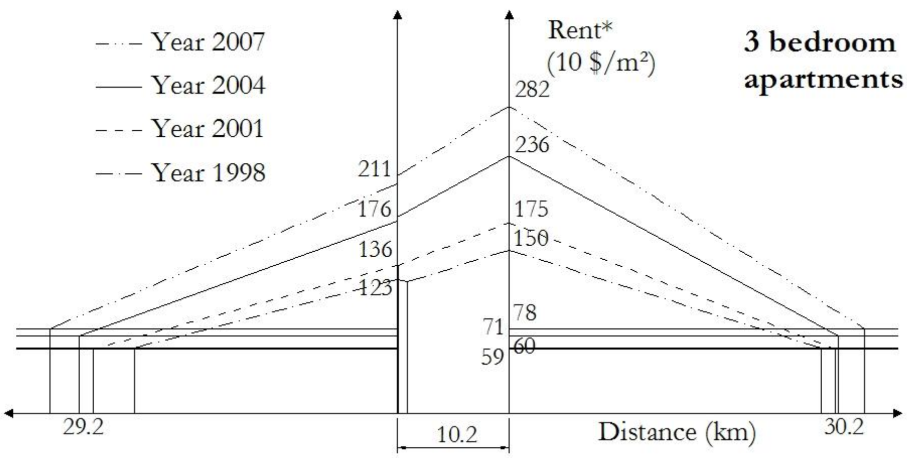

Figure 72 Changes of DR and AR proxies of apartment rent in Seoul (YG-GS)

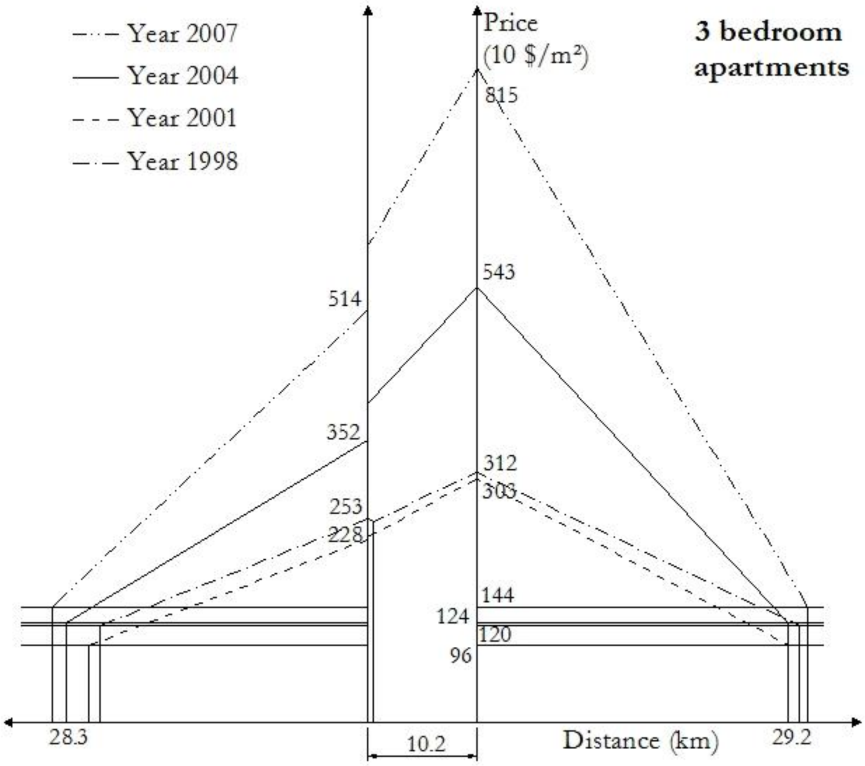

Figure 73 Changes of DR and AR proxies of apartment price in Seoul (YG-GS)

The last two diagrams show the interactions and changes in borders between YG and GS submarkets over time.

The pattern is very similar to those of the JJ and GS submarkets. This is because the dominance of the growth of employment in the GS submarket is overwhelming both JJ and YG. From 2004, the two spatial submarkets are merged into one, in both price and rent data.

Based on the analysis on interactions between spatial submarkets in Seoul, the results can be summarised as follows. Firstly, at least until 1998, Seoul had three spatial housing submarkets of JJ, YG, and GS. Each spatial submarket has its own independent peaks of price and rent cone until then. Thus, spatial analysis before this period should assume different spatial submarkets with three different town centres. Secondly, since 2004, Seoul had only one spatial submarket, as GS submarket merged with the other two submarkets. Since then, the spatial submarket of GS has dominated the structure of the whole housing market in Seoul and the centre of employment of GS has become the centre of employment of the whole housing market. Thus, spatial analysis after this period should assume one merged spatial submarket with one centre, GS. Thirdly, the interaction between JJ and YG after the merging by GS after 2004 has little significance in the structure of the whole housing market, as both of them lie under the influence of the GS submarket. The merger will continue permanently as long as the employment growth of GS continues to exceed those of JJ and YG. Finally, as a result of the merging between spatial submarkets, total land rent attributes would be greater than before the complete merging in the Seoul.

6-6 Conclusion

This chapter investigated the structure of the housing market in Seoul.

Firstly, spatial and sectoral housing submarkets in Seoul have been identified. 2 bedroom apartments, 3 bedroom apartments, and 4 bedroom apartments were selected as the three representative sectoral housing submarkets in Seoul. The identification of spatial housing submarkets was based on two analyses: mapping commuting patterns and the embodiment of 2-D contours and 3-D surfaces of house price. The results of the two types of analysis showed that Seoul consists of a half-merged unity of three different spatial housing submarkets. The major three spatial housing submarkets are GangNam–SeoCho (GS), Joong–JongRo (JJ), and YoungDeungPo–GooRo(YG).

Secondly, regression analysis was conducted to discover the contribution of accessibility to the centres of each spatial housing submarket to apartment price and to construe the structure of land rents in the housing market. The variance in the accessibility variable of physical distance to the centre of each spatial housing submarket explains around 55% of the variance in apartment price and 63% of the variance in apartment rent across all sectoral submarkets.

Thirdly, the coefficients from the regression analysis were used to construct diagrammatic models of the structure of housing market. The changes of DR and AR proxies over a period of 10 years from 1998 to 2007 indicate that there has been a significant increase in differential rent deriving probably from growing commuting costs and an imbalance between the demand and supply operating on the housing market across all sectoral housing submarkets. In addition, two different patterns of changes in DR and AR proxies over time were observed. One is an increase in AR along with an expansion of spatial housing submarkets, and the other is an independent increase in DR. The changes in DR and AR proxies also reveal that the pressure for redevelopment of existing residential properties may vary between sectoral housing submarkets and with the location of properties.

Fourthly, the interactions and changes between spatial submarkets were investigated. The findings are as follows. Firstly, at least until 1998, the city had three spatial submarkets of JJ, YG, and GS. Any spatial analysis before this point in Seoul should regard the city of different spatial submarkets with three different centres. Secondly, after 2004, Seoul had only one spatial submarket as the GS submarket absorbs the other two submarkets. Spatial analysis after this point should regard the city as one merged spatial submarket with one centre, GS. Thirdly, the interactions between JJ and YG after the merger by GS after 2004 had little significance in the structure of the whole housing market as both of them lie under the influence of the GS submarket. Finally, the status of merger will continue permanently as long as the employment growth of GS continues to exceed those of JJ and YG. As a result of the merger between spatial submarkets, total land rent attributes would be greater than before the complete merging in Seoul.

In spite of the limits of analysis from sampling, an alternative use of price data, and imperfectness of regression fit analysis, there are some unique and positive contributions of this empirical study. First, the combined use of mapping commuting patterns and the embodiment of the shape of house prices was suggested as a useful solution to a complicated problem of subdivision of spatial housing submarkets. Second, a diagrammatic modelling based on regression analysis of house prices can be a useful tool for investigating the structure and dynamic movements of land rents in an urban area.

Chapter 7.

Spatial analysis of the housing market in Los Angeles

7-1 Introduction

Los Angeles county is the most populous county in the U.S. with a population of around 1 million people in 2009.[91] It includes 88 incorporated cities and a majority of unincorporated areas. The City of Los Angeles is the biggest city in the county and the second biggest city in the U.S. in terms of population. The county covers 10,518 km^2 with a population density of 1,000 people per km^2. The main mode of transportation in the county is the private car, based on well developed grid highways across the county. Major cities in the county are the City of Los Angeles, Long Beach, Glendale, Santa Clarita, Pomona, Palmdale, Pasadena, Torrance, Lancaster, El Monte, Inglewood, Downey, West Covina, Norwalk, and Burbank, each of whose population is more than 100,000 people each. The most dominant type of housing in the county is the single family detached house, which constitutes 59.3% of the whole housing stock. Other dominant types of housing are the single family condominium, constituting 9.2%, and the town house , which constitutes 10.5% in the total housing stock in the county.

7-2 Commuting patterns and centrality

Commuting pattern is the most direct demonstration of centres of employment in a city. Having argued that a residential sphere consists of a centre of employment and the surrounding residential area, the directions of commuting between sub-centres in merged residential spheres reveal the hierarchical relationship between them. Using the commuting pattern, spatial housing submarkets can be identified.

[91] U.S. Census Bureau, 2009 population estimates

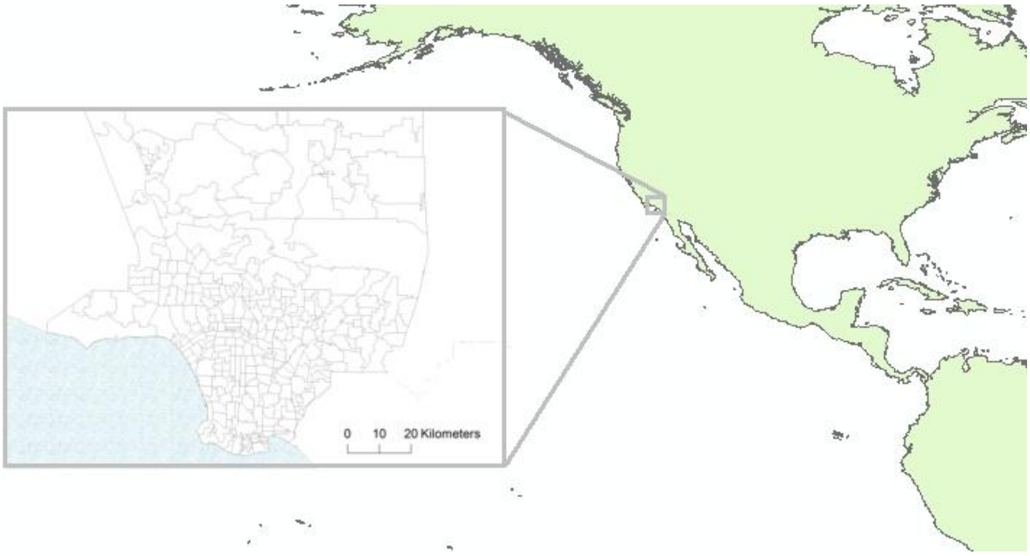

Figure 74 Location of Los Angeles

7-2-1 Data & range of analysis

In the commuting trip statistics of the US 2000 Census data, travel flows by the Census tract block group were used for the network analysis to understand the commuting pattern in Los Angeles county. The commuting data are acquired from the U.S. Department of Transportation[92], where the data of Census Transportation Planning Products 2000 is provided. All of the commuting data for Los Angeles county is extracted from the commuting data of LA-Riverside-Orange counties. A total 399,882 flows from 9,872 residences to 6,266 work places are abstracted from the raw data. As the unit of tract blocks is too small compared to the unit of origin-destination data of London and Seoul, the tract data is set to the unit of commuting data. The size of tract blocks is similar to the size of wards in London. The most similar units of administrative area to the local authorities in London and Seoul are the zip code areas in Los Angeles. However, commuting data organised by zip code areas is not available. A zip code area can include around twenty tract blocks. With the unit of tracts, there are a total of 286,539 flows from 3,247 tracts. As a result, a total of 21606 pairs of origin-destination data were created. For a simple visualisation, three thresholds of number of trips are used. There are 1517 pairs of origin-destination commutes where the trip exceeds 90, comprised of 5.76% of the total trips. There are 543 pairs where the trip exceeds 130 comprised of 2.87% of the total trips, and there

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92 www.dot.gov

are 201 pairs where the trip exceeds 180 comprised of 1.43% of the total trips. The details are in the following table 18.

Table 18 The number of commuting trips in Los Angeles

Threshold	Number of pairs of origin - destination	Total number of trip	Percentage (%)
Total	286,539	3,525,762	100
90	1,517	203,129	5.76
130	543	101,229	2.87
180	201	50,327	1.43

Source: US Census 2000

7-2-2 Commuting patterns & centrality by local authority

In the following maps of commuting patterns, each vertex represents the centroid of each local authority, the size of each vertex represents the number of inflows of commuting to each vertex, and the arrows show the directions and the volume of commuting trips. A network analysis software, Pajek, is used for mapping commuting pattern in the same way as for the London data.

The three maps of commuting pattern organised by thresholds of trips reveal similar structures of commuting in Los Angeles county regardless of the thresholds. According to the maps of commuting patterns in Los Angeles county there are more than 15 centres of commuting inflow indicating the polycentric nature of the county. Among the multiple centres, the major centres of commuting flows in the central area are Century City–UCLA–Beverly Hills, El Segundo-LAX, Torrance, LA downtown, and Pasadena. Other than these, Vernon-Commerce–East LA in the east central, Industry in the east, Long Beach and Long Beach Airport in the south, Santa Monica in the west, and Film industry centres such as the Warner and Universal headquarters in the north also attract inflow commuting from neighbouring areas forming clear centres of employment. In the northern area furthest to the area, Santa Clarita and Palmdale are two clear centres of commuting. This structure of commuting pattern needs to be double-checked with the shapes of house prices in the area in order to subdivide it into spatial housing submarkets.

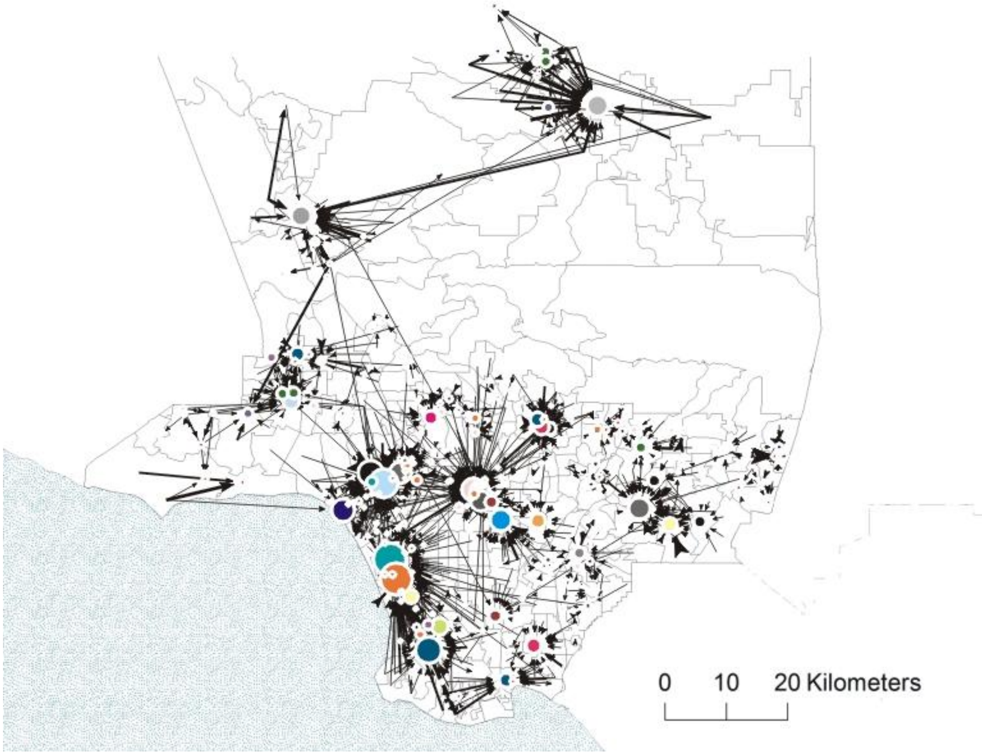


Figure 75 Commuting pattern and centrality by tract block in Los Angeles (over 90 trip)

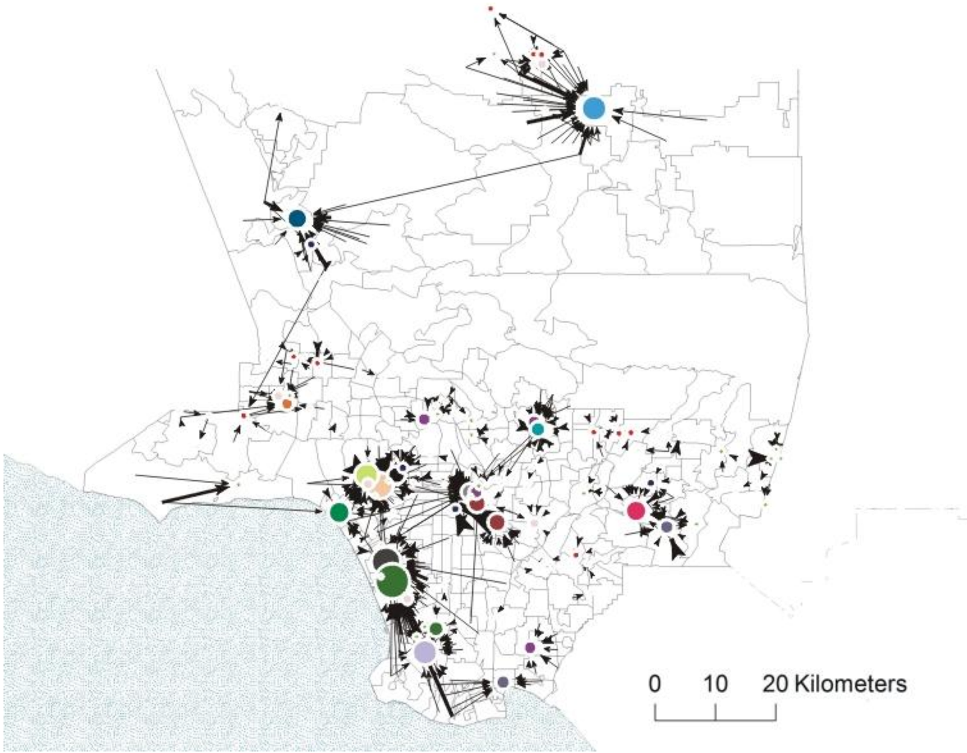


Figure 76 Commuting pattern and centrality by tract block in Los Angeles (over 130 trip)

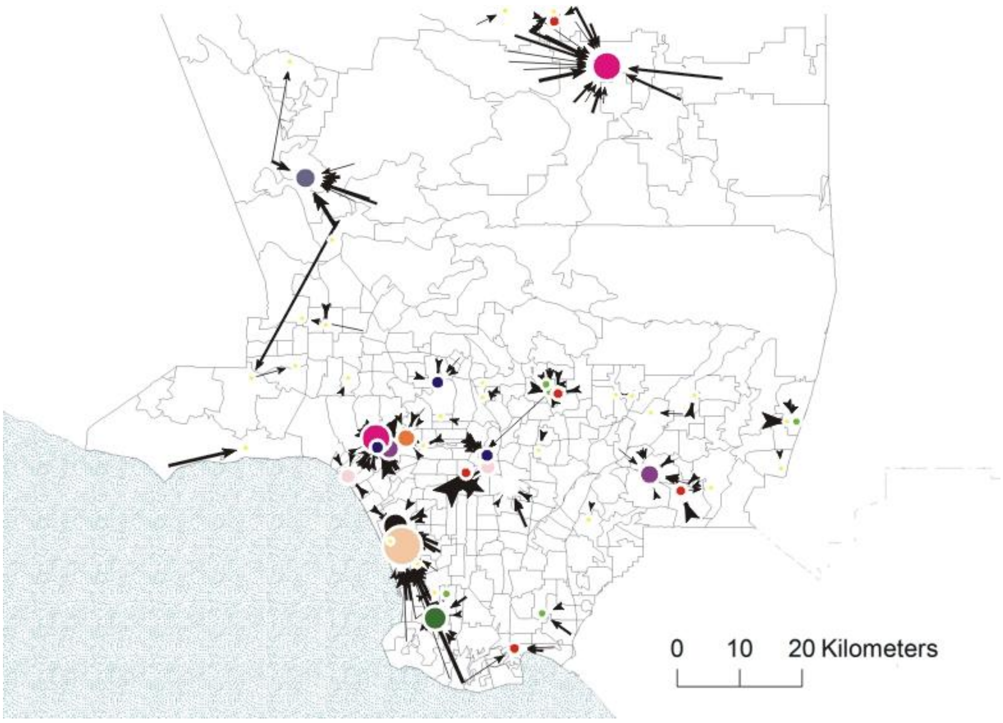


Figure 77 Commuting pattern and centrality by tract block in Los Angeles (over 180 trip)

7-3 Embodiment of house price

Understanding the shape of a housing market in terms of house prices is a crucial process in spatial analysis of a city. It not only enables an overview of the basic structure of house prices of a city but also gives important information on spatial housing submarkets in the city. In this section, the house prices in Los Angeles are embodied to more detailed and readable shapes

7-3-1 Data & range of analysis

The data used for the following analysis is the property information of all 2,363,125 parcels of land in Los Angeles county.[93] It was collected by the county for various purposes including taxation. It includes 28 categories of information of all 2,363,125 parcels of land including parcel size, addresses, property types, the information on houses such as the number of bedrooms, the number of bathrooms, land use, the year of build, transactions, and current value

[93] Source: Southern California Association of Governments

of land and improvements. The most dominant type of housing stock in Los Angeles county is the single family detached house, which forms almost 60% of the total housing stock in the county.

Two dominant types of housing were selected for the following analysis. The first type of housing is a single family detached house without a pool which is 49.2% of total housing stock in Los Angeles. Hereafter, the housing submarket of a single family detached is taken to mean a single family detached house without a pool. The second type of housing is the single family condominium which is 9.16% of the total housing stock. In the first type of housing, the single family detached with 1 unit, 3 bedrooms, and 2 bathrooms is the most dominant group in the stock.[94] In the second type of housing, the single family condominium with 1 unit, 2 bedrooms, and 2 bathrooms is the most dominant group in the stock.[95] In the following analysis, hereafter, 'detached house' is taken to mean a single family detached house without pools with 1 unit, 3 bedrooms and 2 bathrooms, and 'condominium' is taken to mean a single family condominium with 1 unit, and has 2 bedrooms and 2 bathrooms.

Table 19 Types of housing in Los Angeles

Use Code	Frequency	Percent	Type of housing
0100	1,158,129	49.2	Single family detached
0101	242,507	10.3	Single family detached with pools
010C	215,623	9.16	Single family condominium
0200	102,956	4.37	2 units town house
010V	98,674	4.19	Vacant single family detached
010D	59,841	2.54	Planned unit development
0500	59,393	2.52	5 units town house
580V	48,923	2.08	Desert
010E	47,109	2	Condo conversion
0300	35,899	1.53	3 units town house
0400	32,555	1.38	4 units town house
The rest	252,262	10.73	
Total	2,353,871	100	

[94] See appendix 7-1
[95] See appendix 7-1

Compared to sample data of median base in London and Seoul, the data of Los Angeles includes all properties. To control the extreme fringes of the property data, only the data of properties whose floor area and site area lies within the inter-quartile range of the whole data are used. In this way, the lower 25% and the upper 25% in terms of floor area and site area are excluded from the following analysis.

Among the 352 local districts in Los Angeles county, some districts are also excluded from the analysis of embodying house price shape and regression. It is because the properties in the districts are regionally peripheral but too expensive due to natural privileges such as mountains and coasts. The excluded districts are Malibu, Pacific Highlands, Agoura, Calabasas, Westlake Village, Topanga, and Woodland Hills. In addition to this, all unincorporated areas which are mainly located in northern half of the county of the less-populated desert are also excluded in the following analysis.[96]

As the parcel data does not include location data, the location data for each parcel has to be extracted from an ArcGIS file of the whole map of the parcels in Los Angeles county and matched to the parcel file using the unique identity numbers of each parcel. A total of 1,045,359 pieces of data for single family detached houses and 198,214 pieces of data for single family condominiums were used for the analysis. For the time series analysis, price data was used from 4 different points of time 1998, 2001, 2004, and 2007 - for a 10 year period from 1998 to 2007. As the information under the category 'year' in the data indicates the year when ownership changed, the analysis at different points of time has different sets of properties. Structural data for properties such as the number of bedrooms, the number of bathrooms, the floor area, and housing type and other data such as addresses, locations, and past transaction prices were all included in the data.

7-3-2 2-D contour & 3-D surface of house price and rent

In order to figure out the shape of house prices in Los Angeles county, house price data for each property type with location data waw put into a software, 'Surfer', in the same way as for the London data. It produced 2-D contours and 3-D surfaces of house price based on the method of interpolation, which estimates price values in unknown locations using known price

[96] The full list of zips which are excluded in this analysis are 90049, 90077, 90263, 90265, 90272, 90290, 90402, 90704, 91301, 91302, 91361, 91362, 91372, 91384, 91390, 93243, 93510, 93532, 93536, 93543, 93544, 93551, 93553, 93563, and 93586.

data in neighbouring location. A data set of longitude, latitude,[97] and price of properties were used for this process. The unit of price data is set to 10 dollars per m^2 which is the same as other two cities in order to control the variance from floor area and the exchange rate. The calculation of prices of properties in the Los Angeles parcel data consists of price of land and price of improvements by year when the ownership of each property is changed. The two levels of price data of land and improvements are added first, and are then divided by floor area of each house.[98] The variable of price used in the following analysis is based on this calculation.

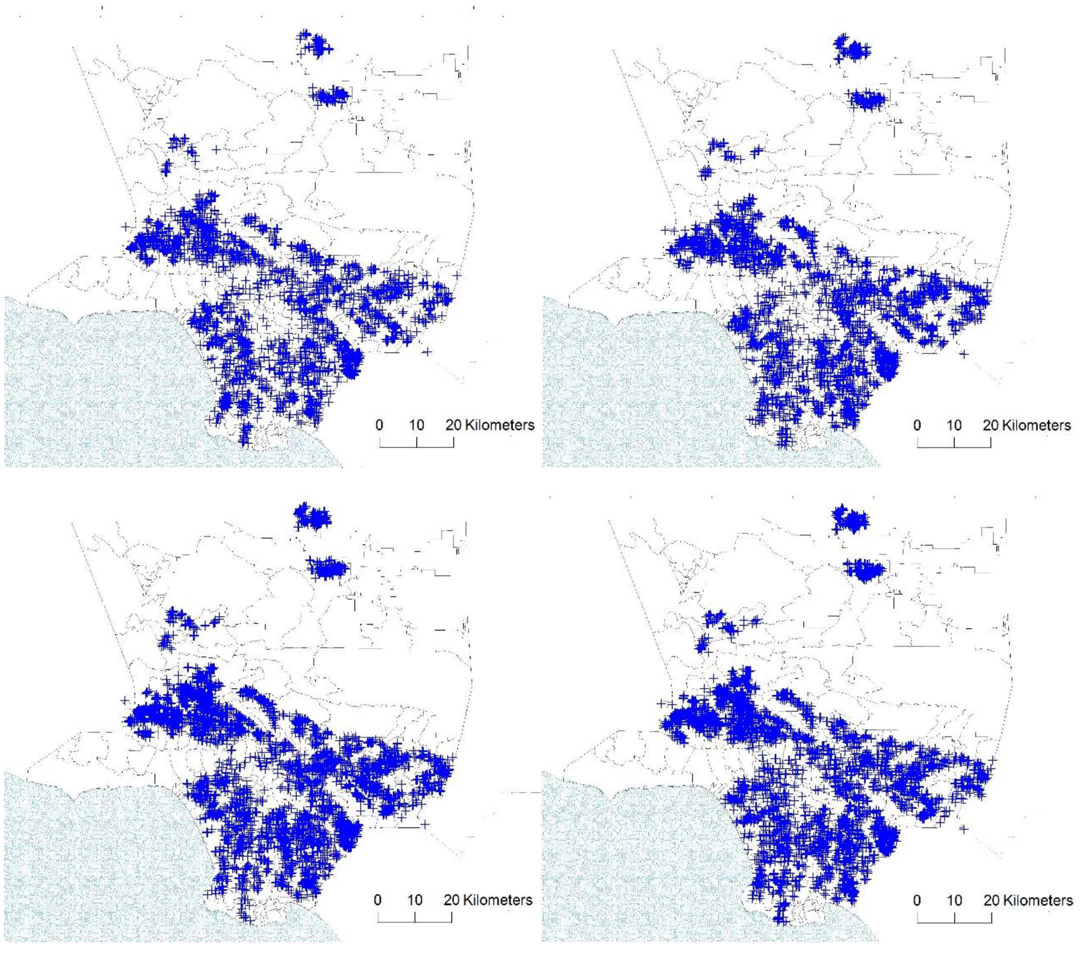


Figure 78 Location of samples houses in Los Angeles

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

[97] Projected coordinate system (PCS) is used for identifying location of each property in analysis of Los Angeles. As the whole parcel data is based on the PCS, other location data in geographic coordinate system (GCS) are all transformed to PCS hereafter.

[98] It normally means the value of improvement in house building. As price data in the other two cities of London and Seoul includes the price of whole property of land and building, price of property in Los Angeles is also calculated by adding the value of land and the value of improvement.

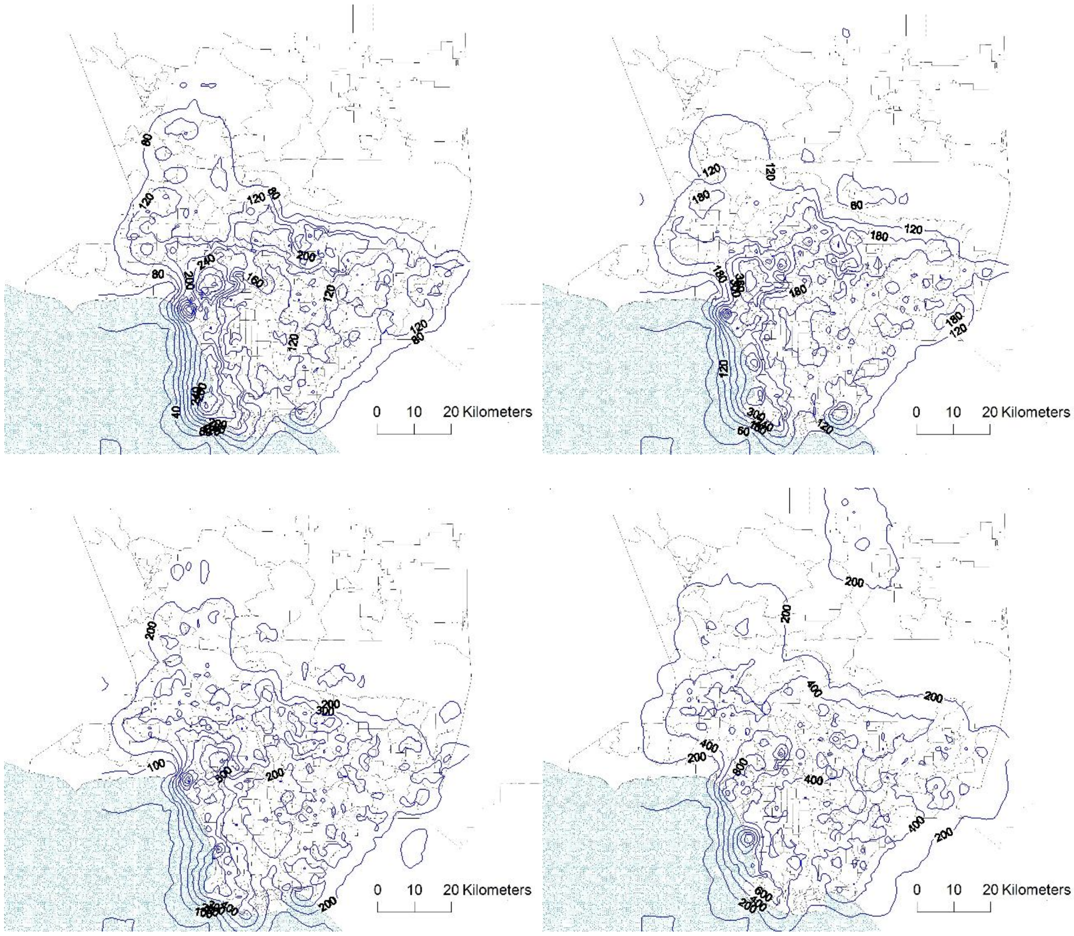


Figure 79 2D contours of house prices in Los Angeles (10 $/m^2$)

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

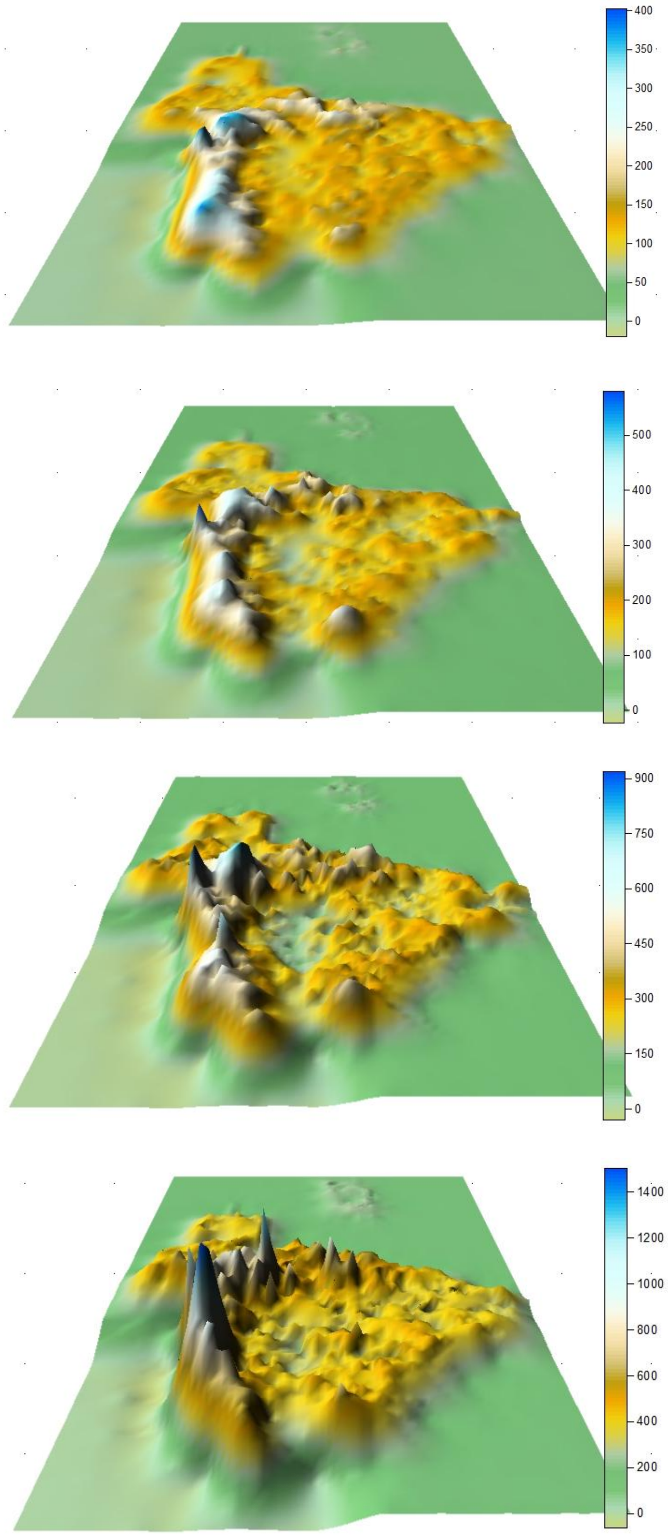


Figure 80 3D shapes of house prices in Los Angeles (10 $/m^2)

(1998, 2001, 2004, and 2007 from the top)

The shape of the whole housing market in Los Angeles county looks quite different from those of London and Seoul. It has multiple peaks of similar sizes rather than a few dominant peaks. Amongst them, some of the most prominent peaks are located along with the west coastal areas to the Pacific ocean such as Santa Monica, Marina del Rey, El Segundo next to Manhattan Beach, and Torrance. In the City of Los Angeles, Century city-UCLA-Beverly Hills has prominent peaks and the peak in LA downtown[99] is also distinguishable. The general dominance of major centres is consistent with the result of the commuting pattern. Other than these, there are prominent peaks in Long Beach and Pasadena.

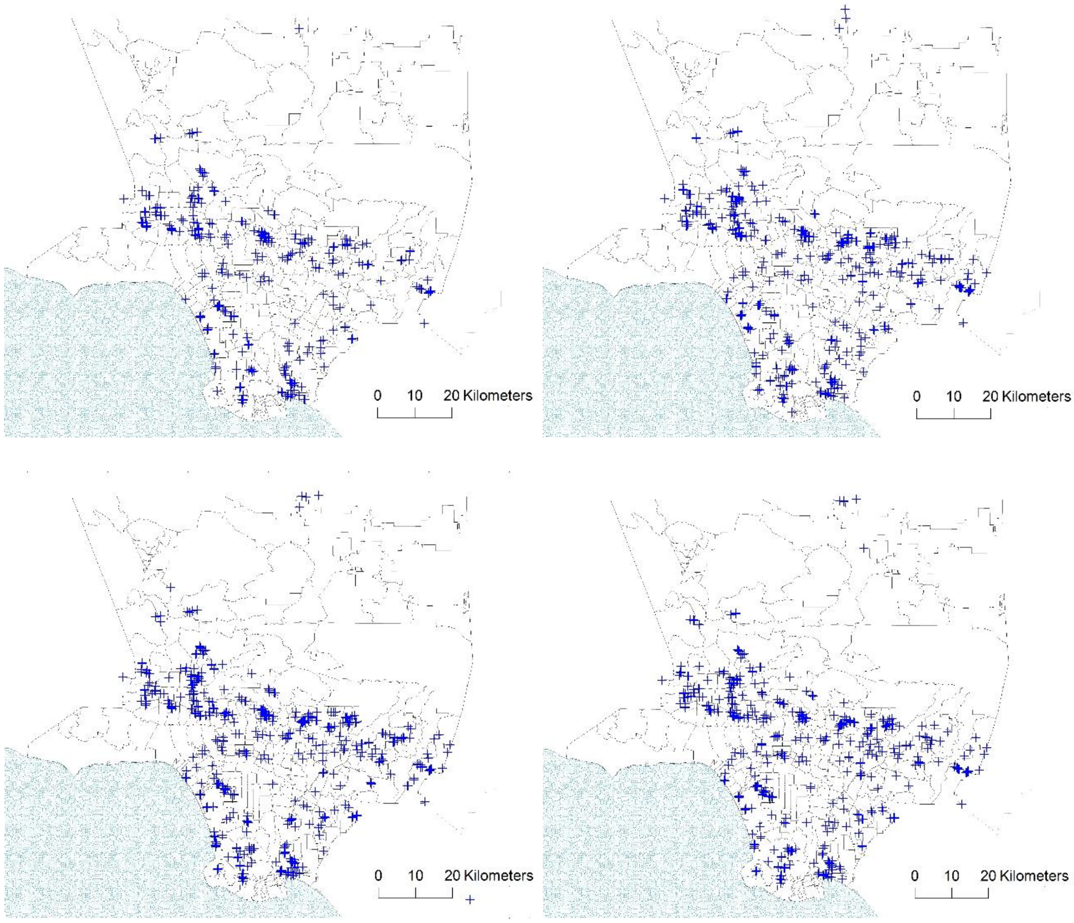


Figure 81 Location of samples condominiums in Los Angeles

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

[99] It covers large area including Vernon, East Los Angeles, and USC.

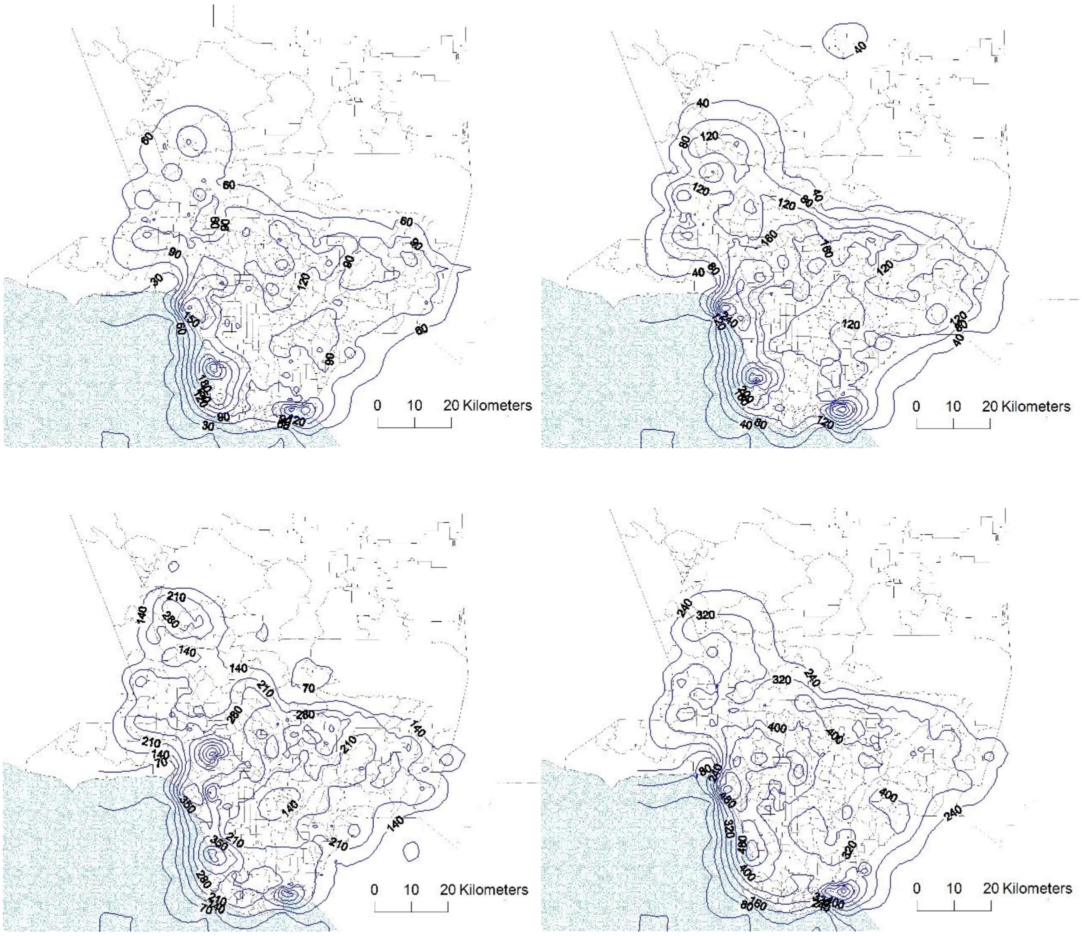


Figure 82 2D contours of condominium prices in Los Angeles (10 $/m^2$)

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

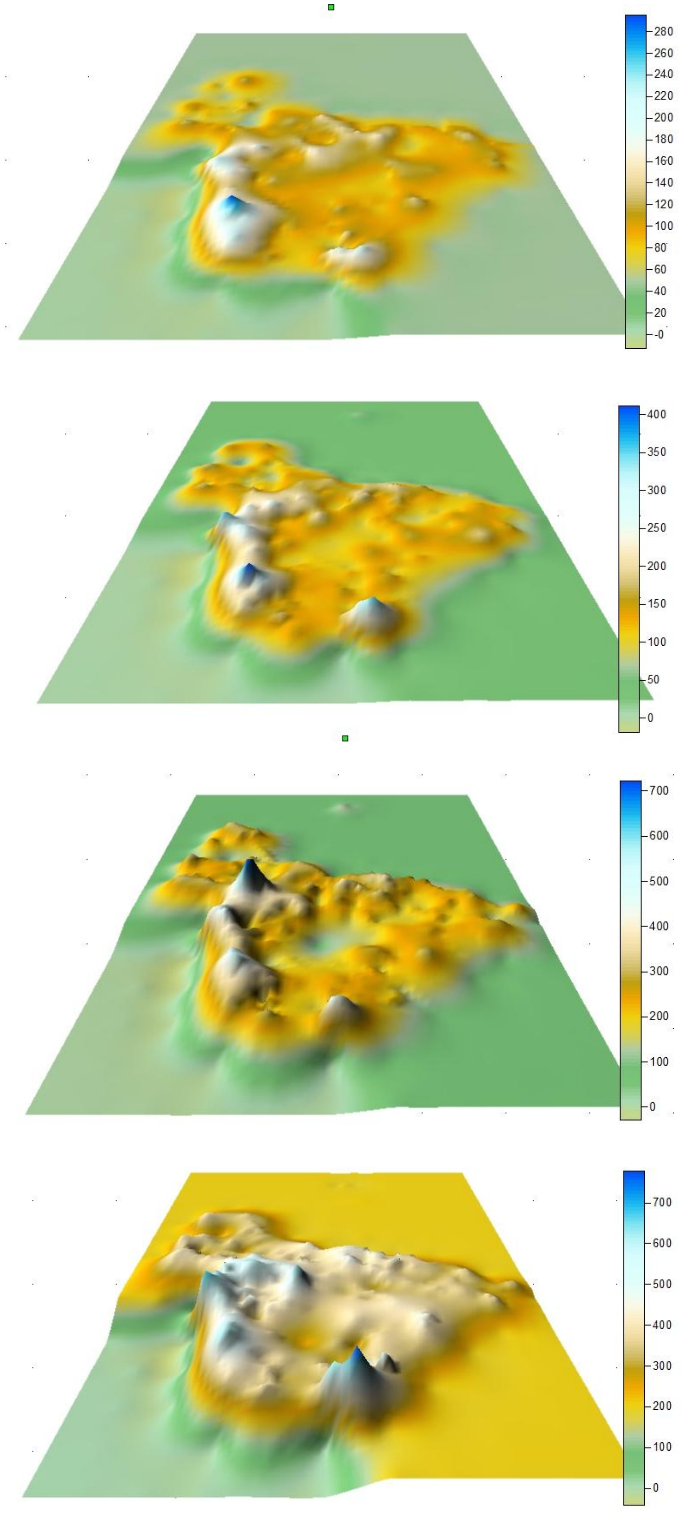


Figure 83 3D shapes of condominium prices in Los Angeles (10 $/m^2$)

(1998, 2001, 2004, and 2007 from the top)

This data may look like a typical polycentric city; considering, however, that the scale of the county (10,518 km^2) is as big as Seoul National Capital Area (11,745 km^2) and the scale of the City of Los Angeles (1,290 km^2) alone is as big as Greater London (1,572 km^2), it is difficult to assume that Los Angeles county is a typical polycentric city. A close observation reveals that the main central area of Los Angeles county has a small number of merged spheres, whereas the outer areas have numerous independent peaks. It implies that multiple centres and the surrounding residential spheres have merged into and formed a few clusters of employment and residential spheres in the populous area in Los Angeles county.

The most distinguishable peaks in the county are Century city–UCLA–Beverly Hills, LA downtown, and El Segundo-LAX. Two peaks of Santa Clarita and Palmdale in the northern area are also prominent but they are located in the peripheral area of the county. Other than these peaks, the rest of the peaks are not significant. The three main peaks in the central area of Los Angeles county will be the main focus of the following analysis. Although the shapes of house prices are consistent with the commuting pattern in the previous section, there are slight differences in location of centres in terms of the shape of house price and the commuting inflow. Firstly, in El Segundo-LAX, and Torrance, which are close to the coast, the centres in terms of house price in the areas are closer to the coasts than to the centres in terms of commuting inflow. In Vernon-Commerce-East LA and Industry where industrial complexes are located nearby, the peaks of house price are nearly negligible in spite of their strong position as the centres of commuting inflow. This can be interpreted as demonstrating that amenity factors, such as being closer to coasts or industrial complexes, are reflected in the house price.

7-4 Subdivision of the housing market

The combined use of commuting patterns and house price surfaces identifies the following major spatial housing submarkets in Los Angeles: 1) Century City-UCLA-Beverly Hills, 2) Santa Monica, 3) LA downtown, 4) Pasadena, 5) El Segundo–LAX, 6) Torrance, 7) Long Beach-San Pedro, 8) Industry, 9) Warner Centre, 10) Chatsworth, 11) Santa Clarita, and 12) Palmdale. Amongst these spatial housing submarkets, three spatial housing submarkets in the central Los Angeles will be analysed further. The three major spatial housing submarkets selected for further analysis are Century City-UCLA-Beverly Hills, LA downtown, and El Segundo-LAX.

For the analysis of sectoral housing submarkets, this study explores two types of sectoral housing submarkets: the single family detached house and the single family condominium.

By sectoral and spatial housing submarkets, a total of 6 housing submarkets are used in the following analysis. They are: single family detached houses in the Century City-UCLA-Beverly Hills [CU] submarket, the LA downtown [LD] submarket, and the El Segundo-LAX [EL] submarket, and single family condominiums in the Century City–UCLA-Beverly Hills [CU] submarket, the LA downtown [LD] submarket, and the El Segundo-LAX [EL] submarket.

The geographical boundaries of the three spatial housing submarkets are a 10 km radius for CU, a 13 km radius for LD, and a 15 km radius for EL. The probable reason why the boundaries are smaller than those in London and Seoul is the fact that these spatial submarkets are surrounded by other spatial submarkets. This is different from the cases of London and Seoul, where spatial submarkets sometimes extend to and meet agricultural land.

Table 20 Major spatial submarkets in Los Angeles

Spatial housing submarket	Zips
CU	90016 90019 90024 90025 90034 90035 90036 90046 90048 90049 90064 90066 90067 90069 90077 90210 90211 90212 90230 90232
LD	90001 90002 90003 90004 90005 90006 90007 90010 90011 90012 90013 90014 90015 90017 90018 90020 90021 90023 90026 90029 90031 90032 90033 90037 90039 90057 90058 90062 90063 90065 90071 90255 90270
EL	90008 90043 90044 90045 90047 90056 90061 90245 90247 90248 90249 90250 90254 90260 90266 90278 90293 90301 90302 90303 90304 90305 90504

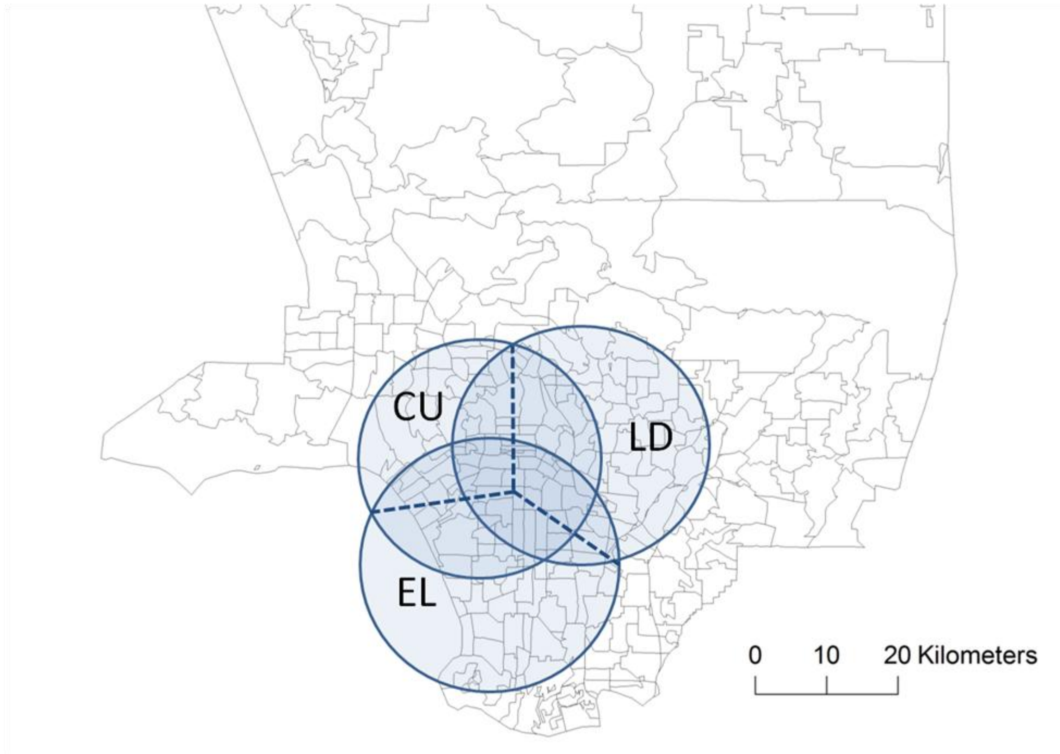


Figure 84 Major spatial submarkets in Los Angeles

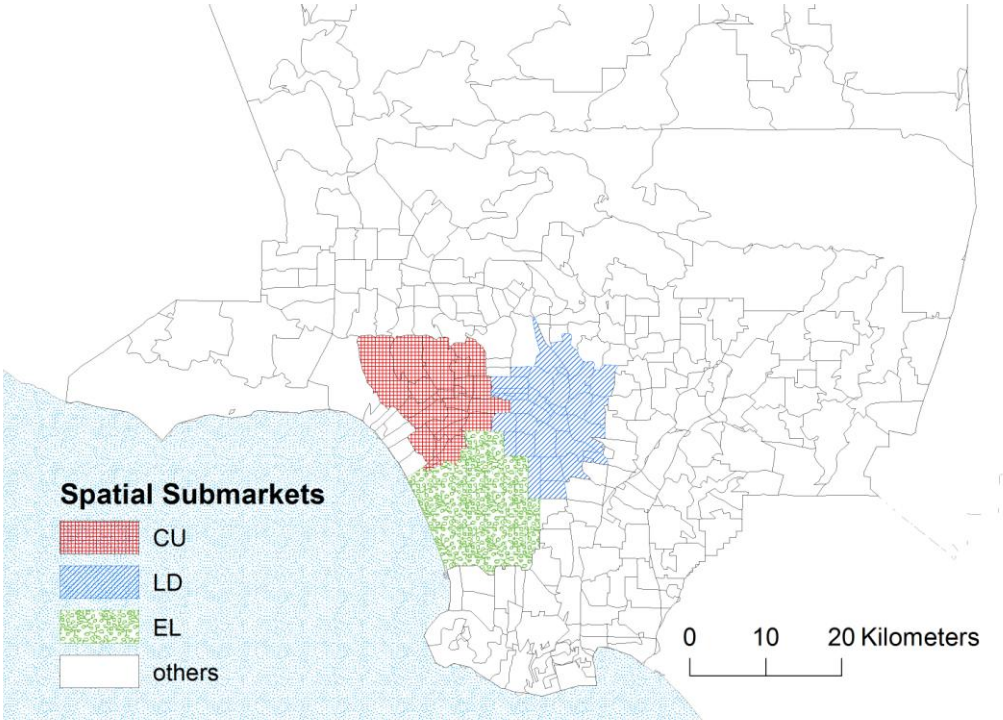


Figure 85 Major spatial submarkets by zip area in Los Angeles

7-5 The spatial structure of the housing market

7-5-1 Data & range of analysis

The first step of the analysis on the spatial structure of housing market is to set locations as the centres of each spatial housing submarket. The set centres of the three major spatial housing submarkets in Los Angeles are based on the centrality analysis from the network analysis, commuting patterns, and employment data.

Table 21 Commuting inflow to top 10 employment centres in Los Angeles

	Centre of employment	Tract ID	Inflow trip
1	LA downtown	207710 207400 207300 226000 207500 207900 207100	194577
2	Century City - UCLA - Beverly Hills	267100 265301 265510 700800 700400	115267
3	Vernon - Commerce - East LA[100]	532400 206050 532303 532304 203300	113726
4	El Segundo - LAX	620003 620501 278000	103697
5	Torrance	651101 650901 650400	53391
6	Long Beach	573500 576000	44838
7	Industry	408202 408211	37798
8	Pasadena	461900 463600	32768
9	Santa Monica	701900 701801	32741
10	Warner Center	137102 134902	29953

Based on the comprehensive application of the three approaches, the location of centre of CU spatial housing submarket is set to the central point between Century City block, UCLA, and Beverly Hills as they locate closely each other with distances of less than 2 km. The location of the centre of LD spatial housing submarket is set to the centre point of LA downtown block,

[100] Although this area of blocks has the third largest commuting inflow, it has been excluded from the following analysis. This is because this area incorporates various other factors which influence the price of housing markets such as ethnicity. Related research (E. Soja et al. 1983) indicates that this area has the largest proportion of Black and Hispanic inhabitants. The influence of this factor can also be identified in the shape of house price, which has weak peaks, despite the fact that this area is advantageous in terms of commuting. This inconsistency between advantage in commuting and house price is largely due to the existence of the external factors. Subsequently, this inconsistency exposes this area to the massive pressure for redevelopment in the name of gentrification.

and the location of the centre of EL spatial housing submarket is set to the centre point of El Segundo block.[101]

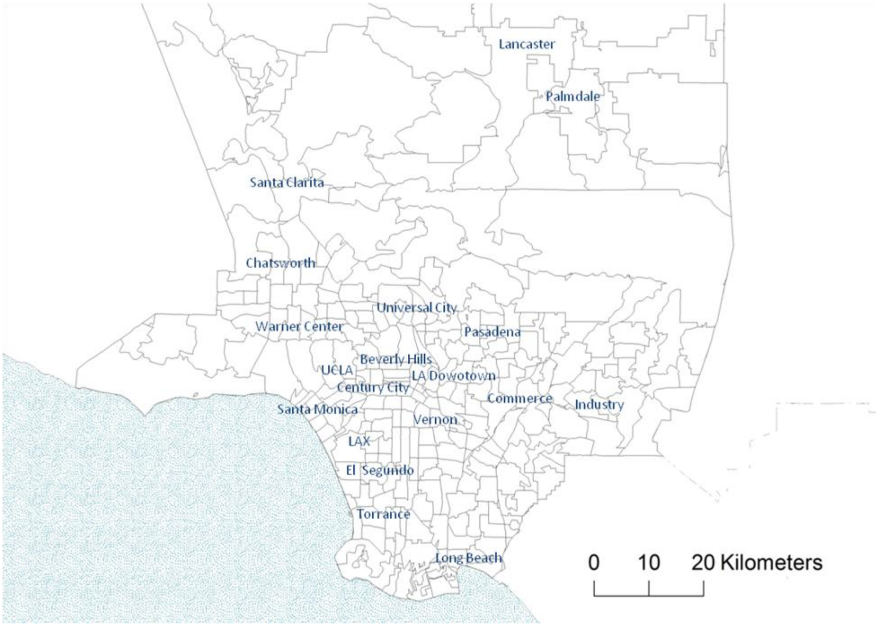


Figure 86 Major centres of employment in Los Angeles

The three centre points will be assumed to be the centres of the three spatial housing submarkets. As the main mode of transportation for commuting in Los Angeles is private car use,[102] the distance based on the real road system can be a relevant measure representing accessibility to centres. For simplicity, the physical linear distances from each location of property to the centres of each housing submarket are used as a measure of accessibility in the following analysis.

7-5-2 Regression analysis of price on accessibility by submarket

A regression analysis of house price on the distances to the centres of each spatial housing submarket has been conducted in this section. Using this process, the contribution of accessibility to the centres of Los Angeles to the price of houses can be examined. In addition, the coefficients of gradients and constants can be applied to analyse the structure of land rents in an urban context.

[101] See appendix 7-6
[102] See appendix 7-5

The regression analysis is conducted by anlaysing the price of houses on the distances to the centres of each spatial housing submarket. The analysis is conducted in all three spatial housing submarkets (CU, LD and EL) and the two sectoral housing submarkets: 3 bedroom detached house and 2 bedroom condominium. As the data of house price in the past is based on the transaction price, the number of properties used in each analysis varies over time. In each year around 100 detached houses and around 50 condominiums for CU submarket are used for the following analysis. Around 80 of detached houses and around 40 of condominiums from the LD submarket are used. Around 200 of detached houses and around 60 of condominiums from the EL submarkets are used. Scatter plots, regression fit lines, and 95% confidence intervals of the three main spatial housing submarkets in Los Angeles county have been drawn at 3 years intervals from 1998 to 2007 in the following diagrams. The statistical results from the regression of R^2, coefficients, t-values, and 5^{th} percentiles can be seen on the tables.

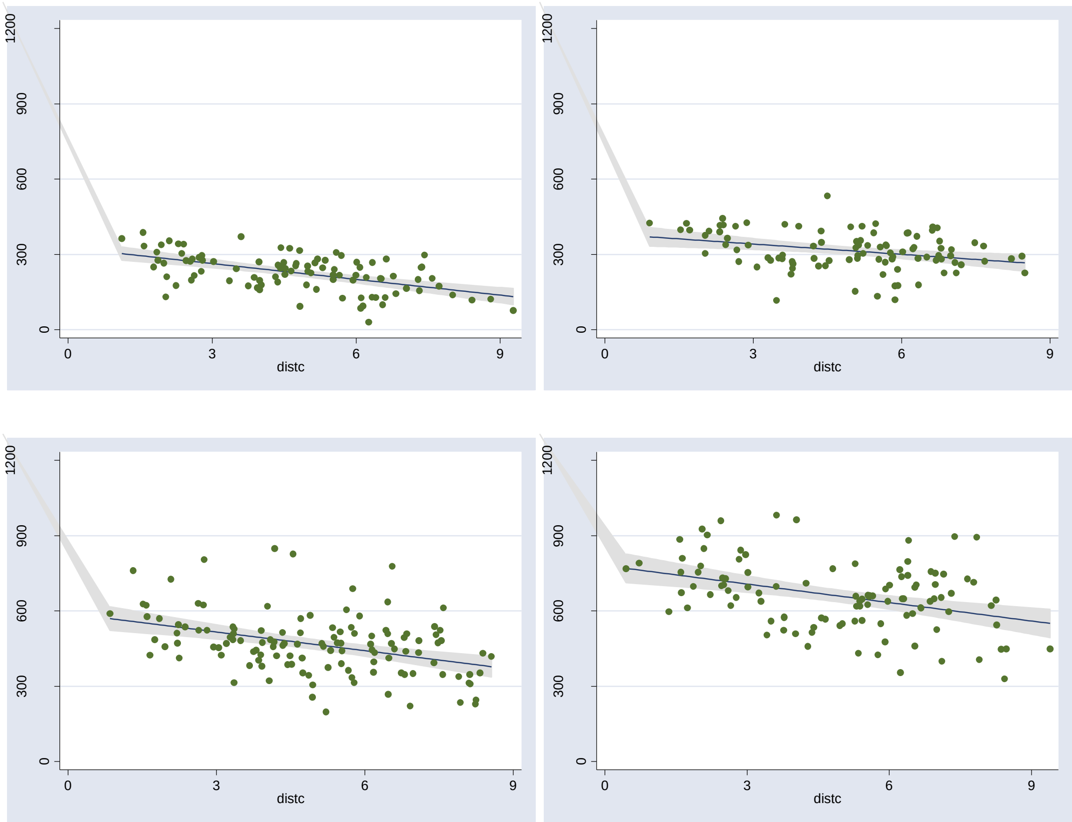


Figure 87 Scatter plot of house price on distance to employment centre in CU of Los Angeles (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

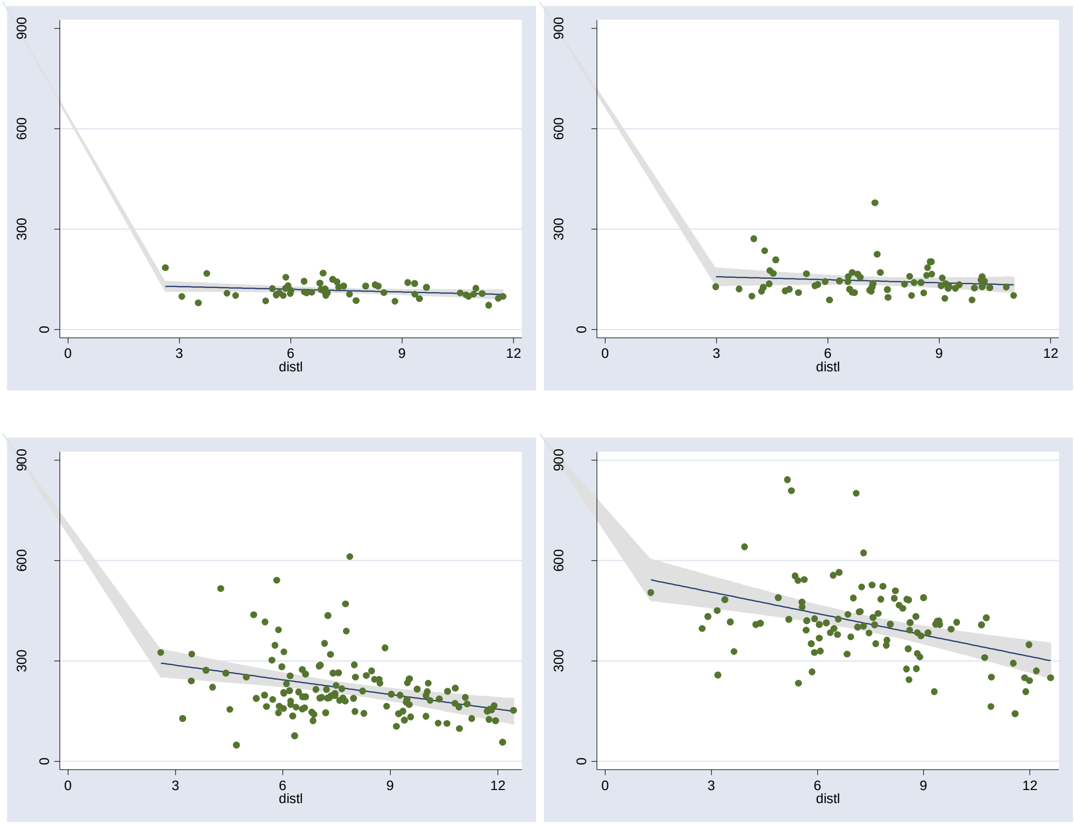
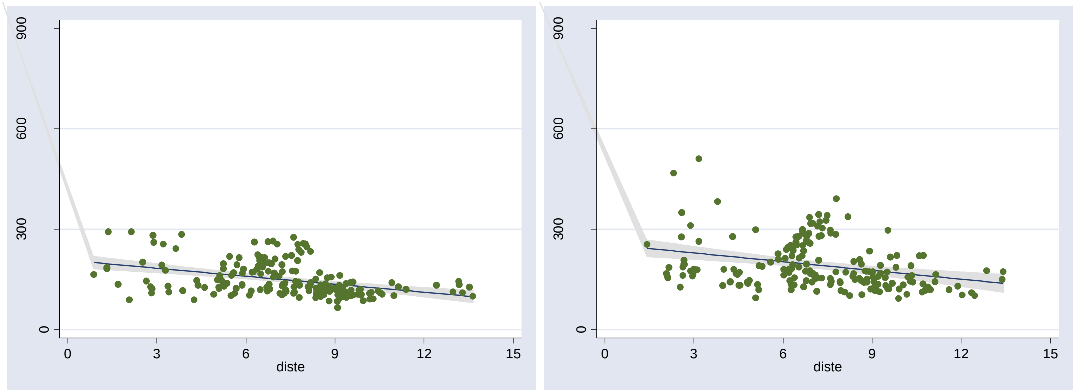


Figure 88 Scatter plot of house price on distance to employment centre in LD of Los Angeles

(1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)



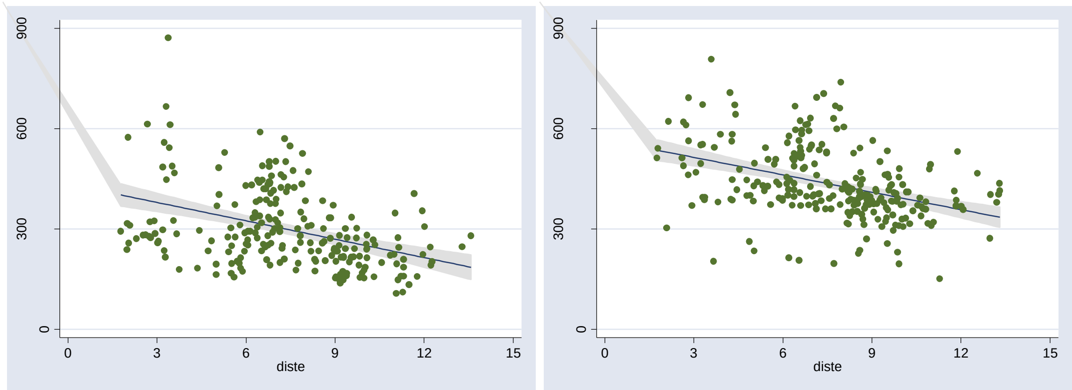


Figure 89 Scatter plot of house price on distance to employment centre in EL of Los Angeles (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

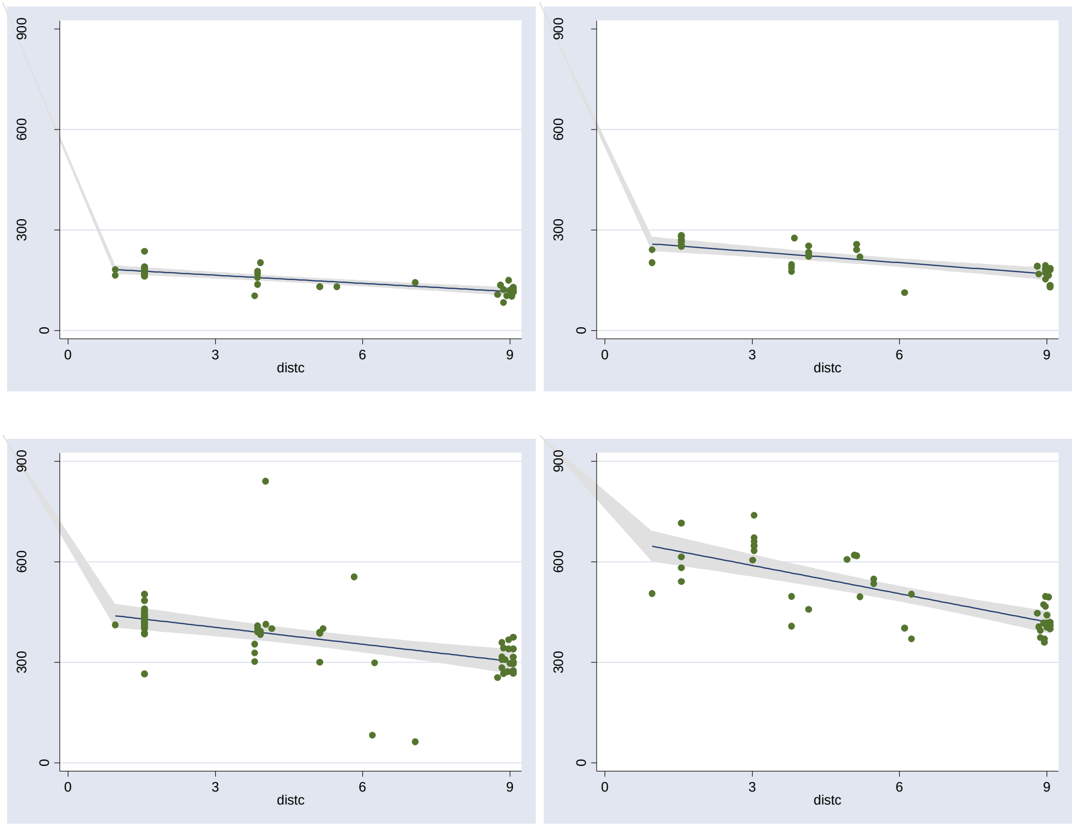


Figure 90 Scatter plot of condominium price on distance to employment centre in CU of Los Angeles (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

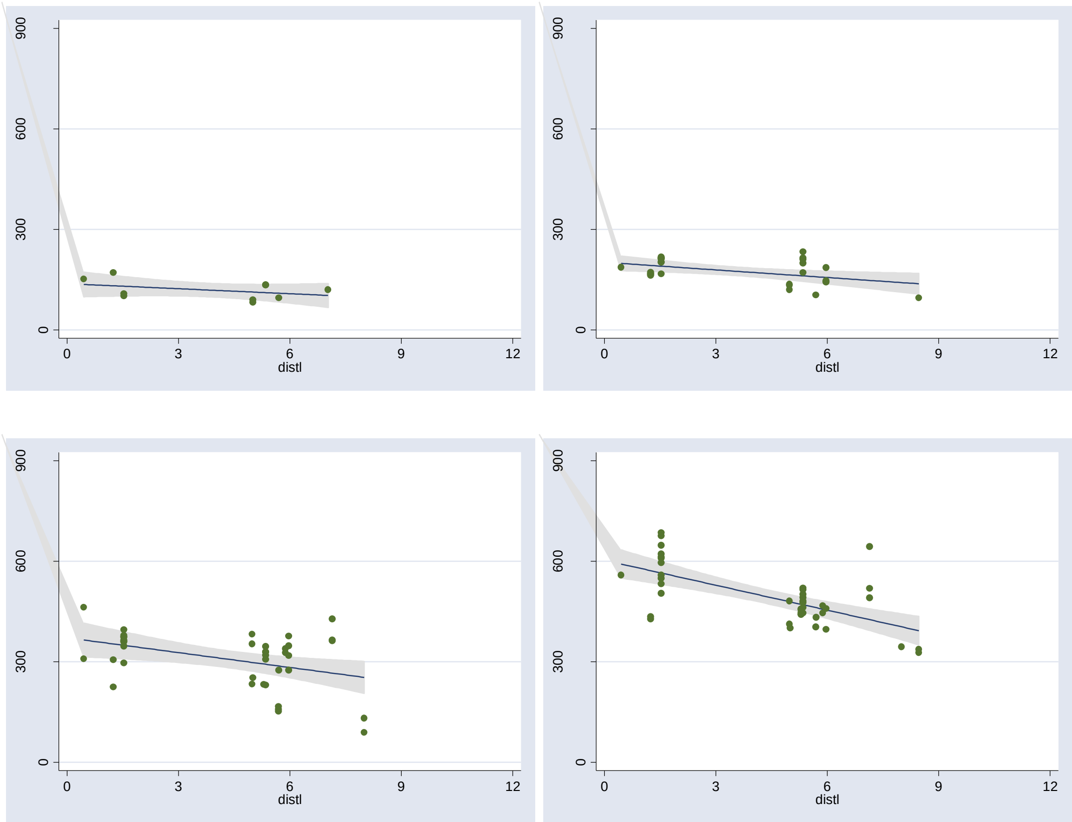
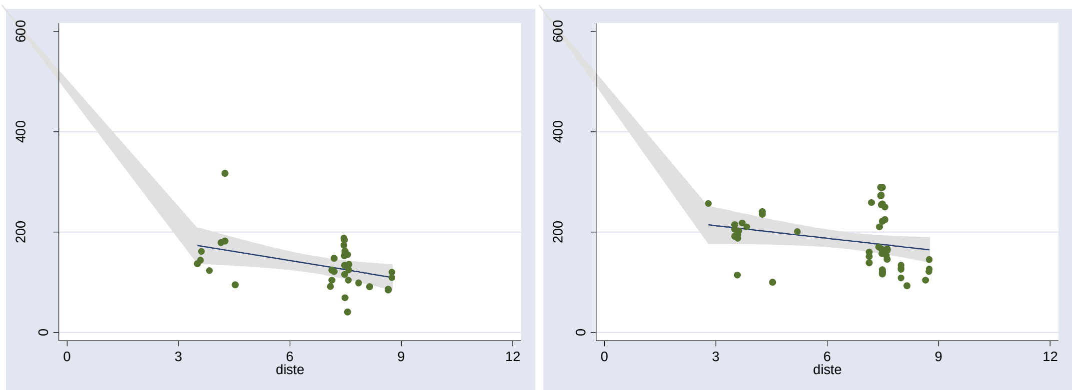


Figure 91 Scatter plot of condominium price on distance to employment centre in LD of Los Angeles (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)



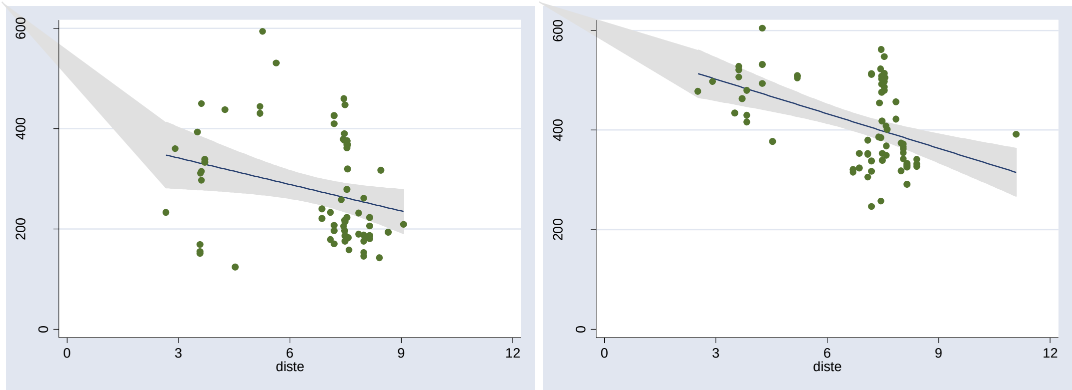


Figure 92 Scatter plot of condominium price on distance to employment centre in EL of Los Angeles[103] (1998 top left, 2001 top right, 2004 bottom left, 2007 bottom right)

Several points can be observed from these diagrams.

Firstly, the expected negative linear correlation between house price and the distance to the city centre has been found across all housing submarkets over time even in the typically polycentric city of Los Angeles. Secondly, the changes of gradients in scatter plots over time show a similar pattern of changes by sectoral and spatial housing submarket. Thirdly, the gradients of the fitting line get steeper over time. Finally, the variance in prices has increased over time across all housing submarkets. These features are the same as the result from the previous two cities. However there are some differences in these diagrams.

Secondly, the boundaries in these diagrams have little substantiality as the ranges of the three spatial housing submarkets in Los Angeles are limited by other surrounding spatial submarkets. For example, CU spatial submarket is surrounded by Santa Monica in the west, LAX in the south, LA downtown in the east, and Warner centre and Van Nuys in the north. LD spatial submarket is also surrounded by CU in the west, Vernon in the south, Pasadena in the east, and Universal and Burbank in the north. This pattern is different from cases of London and Seoul where boundaries are met with non-urban land use, for example green belt or agricultural land. Secondly, the properties of the condominiums submarket show a particular pattern of clusters. As the data set is based on the change in ownership, the presence of vertical clusters of properties in the scatter diagram is likely to portray the initial sales of properties in one newly

103 The reason why the scatters concentrate in few points in the diagrams is related to the characteristics of the data of transaction prices in the past which is based in the year when the ownership of each property is changed. When new condominiums are built and sold in units, multiple changes of ownership can be made in one place, which make the scatters concentrated in few locations.

built condominium or development. In regression, this existence of clusters of points in two places can falsely lead to a strong linear correlation between variables, forming a line between the two places with an increased value of R^2. In spite of this fact, the following result of regression with these variables is reliable because multiple clusters are forming linear relationship.

Results from the regression analysis of house prices on the distance to the centres of each spatial housing submarket by sectoral housing submarket are summarised in the following tables.

Table 22 OLS Regression of house price on distance to employment centre in Los Angeles

Submarket	year	Sample size	R^2	Coefficient (dist)	Coefficient (constant)	5th centile*
CU	1998	97	0.2982	-21.0 (-6.35) ***	327 (19.28)***	94
	2001	96	0.0994	-13.7 (-3.22) **	382 (17.14) ***	110
	2004	125	0.1548	-24.9 (-4.75) ***	591 (21.17) ***	149
	2007	106	0.1464	-24.5 (-4.22) ***	781 (24.97) ***	270
LD	1998	53	0.0721	-2.7 (-1.99) *	136 (13.03) ***	94
	2001	66	0.0185	-3.0 (-1.1)	167 (8.07) ***	110
	2004	122	0.1166	-14.6 (-3.98) ***	331 (11.18) ***	149
	2007	98	0.1792	-21.4 (-4.58) ***	570 (15.57) ***	270
EL	1998	192	0.1614	-8.0 (-6.05) ***	207 (20.29) ***	94
	2001	188	0.0944	-8.7 (-4.40) ***	255 (16.97) ***	110
	2004	230	0.1596	-18.3 (-6.58) ***	434 (20.03) ***	149
	2007	256	0.1596	-17.4 (-6.94) ***	566 (28.24) ***	270

Values in parentheses are t-values
* significant at 5% ** significant at 1% *** significant at 0.1%
* 5th percentiles are based on normal distribution in the whole market of Seoul

The simple regression shows several characteristic points.

Firstly, the variation in the distances to the centres explains about 14% of the variation of price in the group of single family detached houses and about 30% of the variation of price in the group of single family condominium in each housing submarket. In general, the explanatory power of accessibility to the centre is weaker than in London and Seoul. This is partly due to the allowance of the wider variance of floor area in the Los Angeles data than in the other two cities. The existence of other factors, such as ethnic grouping by area, might also partly contribute to the weakness of correlation in the case of Los Angeles. The reason that the distance factor is greater for condominiums than houses is shown by the clustered pattern of properties in the scatter diagram. .At the same time, it might also mean that the demand for condominiums is more likely to be affected by the desires of real commuters to the town centres than the demand for houses, which was also the case in flats and houses in London.

Table 23 OLS Regression of condominium price on distance to employment centre in Los Angeles

Submarket	year	Sample size	R^2	Coefficient (dist)	Coefficient (constant)	5th centile*
CU	1998	37	0.6437	-8.15 (-7.95) ***	190 (30.59) ***	84
	2001	33	0.5627	-11.1 (-6.32) ***	269 (24.33) ***	112
	2004	67	0.2767	-16.9 (-4.99) ***	455 (23.01) ***	158
	2007	43	0.5816	-28.1 (-7.55) ***	674 (27.02) ***	326
LD	1998	10	0.1651	-5.0 (-1.26)	138 (7.88) ***	84
	2001	28	0.2204	-7.6 (-2.71) **	202 (17.27) ***	112
	2004	56	0.1631	-14.8 (-2.69) **	372 (13.73) ***	158
	2007	43	0.4203	-24.8 (-5.45) ***	603 (26.60) ***	326
EL	1998	33	0.1740	-12.1 (-2.56) **	215 (6.55) ***	84
	2001	51	0.0701	-8.4 (-1.92) *	238 (8.00) ***	112
	2004	68	0.0778	-17.6 (-2.36) **	395 (7.64) ***	158
	2007	75	0.2133	-23.1 (-4.45) ***	571 (15.74) ***	326

Values in parentheses are t-values
* significant at 6% ** significant at 2% *** significant at 0.1%
* 5th percentiles are based on normal distribution in the whole market of Seoul

Secondly, sectoral submarkets have similar levels of gradients in each base year of 1998, 2001, 2004 and 2007. Except for the gradients of the CU house submarket, the magnitudes of gradients have doubled in 10 years from around - 10 to - 20.

The gradients have increased in a similar pattern over the years across all submarkets. The changes from 2001 to 2004 are the most significant while changes from 1998 to 2001 and from 2004 to 2007 are not that significant. The coefficients of constants have similar values and a similar pattern of changes over time across all housing submarkets except for in the CU house submarket. Finally, the changing pattern of 5th percentiles shows the same trend over time. The

5th percentiles gradually increased from 1998 to 2004 and soared to almost double in the period 2004 to 2007.

These characteristics of changes can be interpreted with the understanding of the dynamic changes of land rents in the following section.

7-5-3 Dynamic changes of differential rent & absolute rent

This section uses the coefficients of the regression for further analysis as they can be used to figure out the dynamic changes of land rents in housing market. Firstly, the coefficients of accessibility can be understood as the contribution of differential rent to the variance of house price. Secondly, the constants can be understood as the height of the base of the cone of house price. Thirdly, the 5th percentiles can be regarded as the minimum level of house price in a given time in a certain sectoral housing submarket, which reflects the level of absolute rent in each sectoral housing submarket. The boundary of a spatial housing submarket then can be deduced from the combined use of coefficients of accessibility to the centre, constants and 5th percentiles of house price.

Based on these data of coefficients and 5th percentiles, structure of price of detached house and condominium in Los Angeles over time has been drawn. Residuals from sampling, extreme values, and other various factors affecting actual contracts of transactions of house are all making it difficult to find the underlying trend of price of house. Moreover, there are many factors affecting house price such as the construction cost and the speculative expectation on future price other than capitalised land rents. The substitution effect between house buying and renting also makes it difficult to simply regard house price as a capitalised rent. Nevertheless, the lines of house price by housing submarket over time in the following diagrams can be a starting point for the proper analysis to reveal the structure and dynamic movements of land rents in urban area. Forsimplicity, accessibility factor in house price which reflects differential rent will be called DR proxy and the 5th percentile of house price which reflects absolute rent will be called AR proxy hereafter.

These 6 diagrams show changes in DR and AR proxies over time by sectoral housing submarkets of single family houses and single family condominiums and by the spatial housing submarkets of CU, LD, and EL in Los Angeles. These diagrams of changes in the price of detached houses and condominiums over time imply various points.

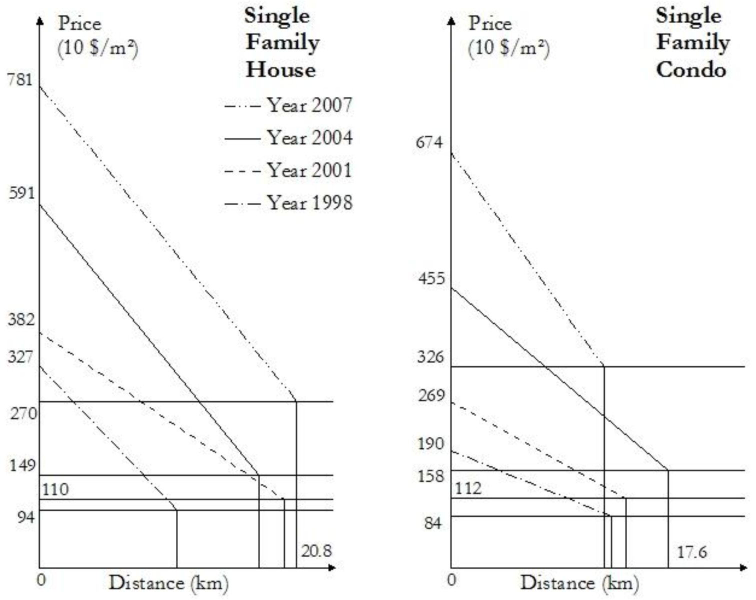


Figure 93 Changes of DR and AR proxies of property price in Los Angeles (CU)

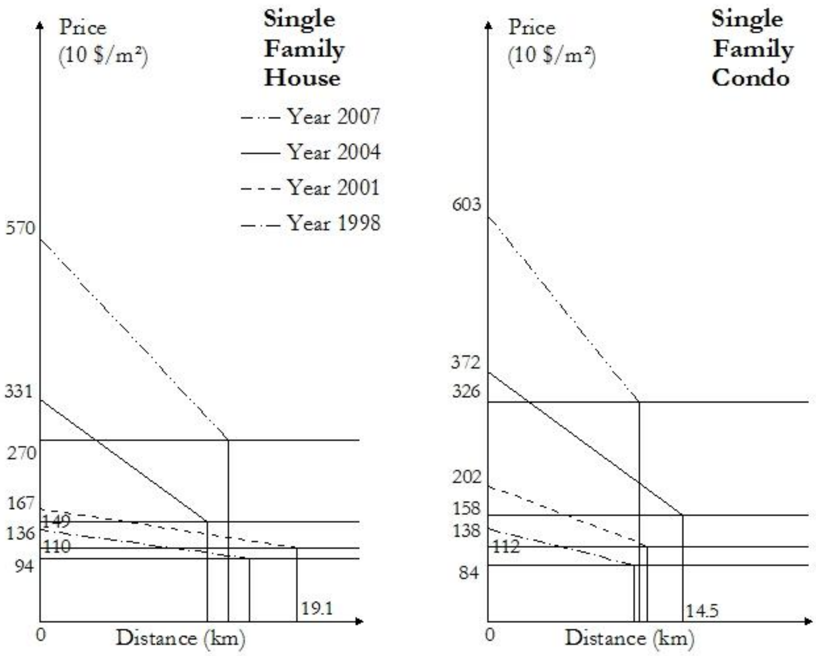


Figure 94 Changes of DR and AR proxies of property price in Los Angeles (LD)

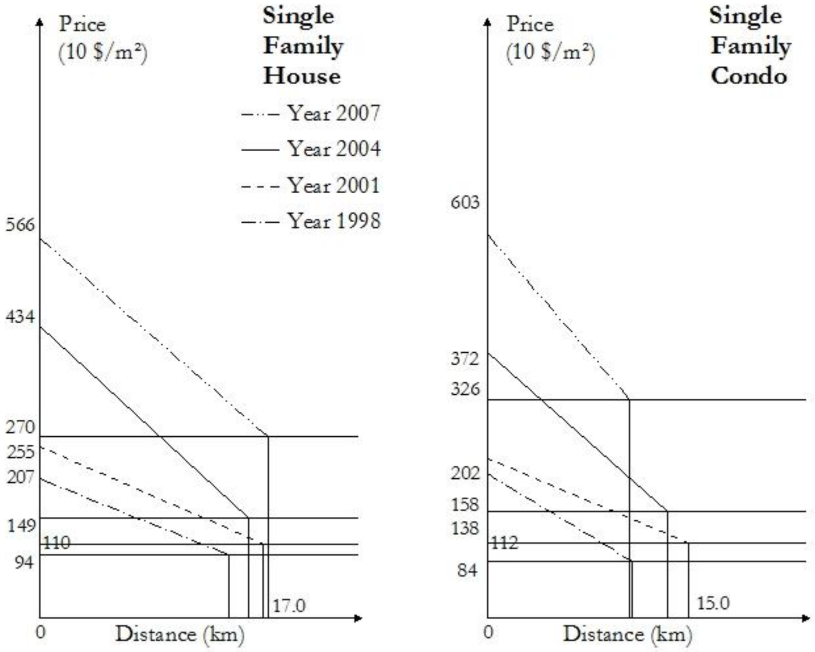


Figure 95 Changes of DR and AR proxies of property price in Los Angeles (EL)

Firstly, the gradients of DR proxies in all sectoral and spatial housing submarkets show a similar pattern of changes, except for the CU house submarket. There were no significant changes of gradients between 1998 and 2001, which implies that there were no significant changes in DR proxies such as commuting costs. However, the changes from 2001 to 2004 show a significant change as magnitudes of gradients increase. The gradients remain their steepness from 2004 to 2007. As DR reflects the advantage inherent in living closer to the centre of employment, this pattern of changes can be interpreted to show that the commuting costs have been increased or that the benefits to be gained from living closer to the central area has increased. For the same period, the international price of crude oil has started to significantly increase from 2002.[104] This fact may explain the changes of DR proxies of house prices in Los Angeles during the period.

[104] Source: IMF, 'monthly primary commodity prices'

Table 24 Changes of AR proxies of property price in Los Angeles

Year	Detached house		Condominium	
	AR proxy	change	AR proxy	change
1998	94		84	
2001	110	+ 17 %	112	+ 33 %
2004	149	+ 35 %	158	+ 41 %
2007	270	+ 81 %	326	+ 106 %

Secondly, the levels of AR proxies significantly increased with a similar pattern of changes across all submarkets. The level of AR proxies in detached houses tripled and the level of AR proxies in condominium quadrupled over 10 years. These increases are far greater than the increase of 50% in Seoul and 100% in London for the same period. The increase in the AR proxies tends to accelerate over time. The rate of change in AR proxies of detached houses and condominiums from 2004 to 2007 reached 81% and 106% respectively. Given that the actual demand for domestic properties did not increase as abruptly as this figure of 300% or 400% over 10 years, it can be deduced that these increases of 5th percentiles are mainly based on speculative motivation rather than an increase in actual AR proxies. This can be crosschecked with the collapse of property prices after the crisis caused by the subprime mortgage market after 2008. The availability of rent data in Seoul enables a comparison of the changes in 5th percentiles of price and those of rent so that it can be identified whether the changes in 5th percentiles are due to AR proxies by actual demand or mere speculation. This identification is not available in the case of Los Angeles, due to the absence of rental data. However, the increased price of properties can also force AR proxies in rent to increase. If house prices are so high that the demand of the sales market transfer to the demand for the rental market, AR proxies can go up by the increase of demand in the rental market. In this case, it would be inappropriate to assume that price increase by speculation has nothing to do with increase in AR proxies in land rent.

Thirdly, the pressure for redevelopment varies by sectoral housing submarkets and locations. The AR proxies of the sectoral housing submarkets have changed together in similar patterns. The AR proxies for detached houses are slightly greater than that of condominiums in 1998. The AR proxies of the two sectoral housing submarkets reached a similar level as in 2001. From 2001 until 2007, the AR proxies for condominiums outstrip those of detached houses. This can be interpreted as demonstrating that the relative preference for condominiums exceeds that for detached houses since 2001, which implies that the market recognises condominiums as more profitable than detached houses in general. If other conditions remained equal, space has therefore been more likely to be developed into condominiums than detached houses in Los Angeles since 2001. In addition to this, as the slopes of DR proxies get steeper over time, the central areas have experienced a greater and increasing pressure for redevelopment compared to the outer areas. The pressure on space for redevelopment keeps changing by time.

The diagrams of DR and AR proxies can be applied to investigate the interaction between and changes in borders between spatial housing submarkets. The following four diagrams show the interactions and changes in the borders between 1) CU and LD submarket, 2) EL and CU submarket, 3) EL and LD submarket in terms of house price. The first two diagrams are those between the CU and LD submarkets.

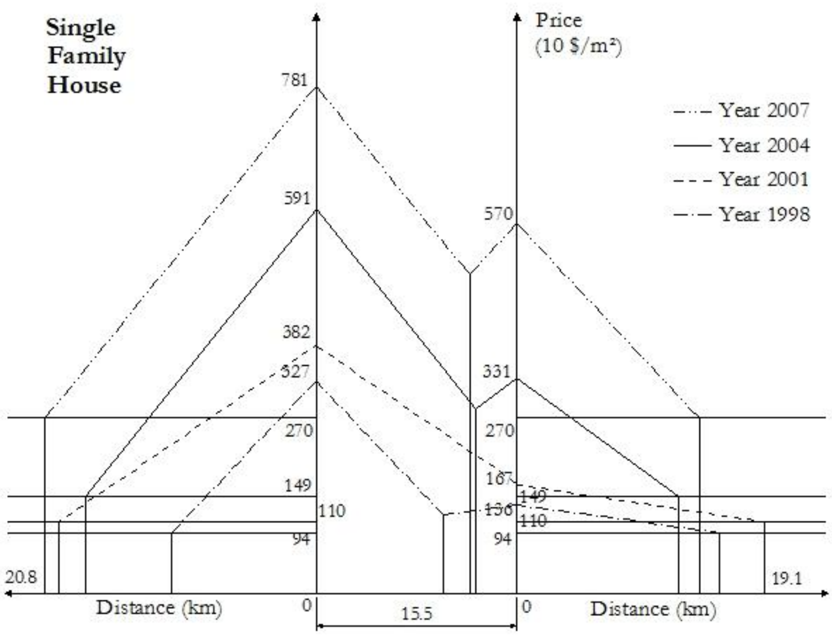


Figure 96 Changes of DR and AR proxies of house price in Los Angeles (CU-LD)

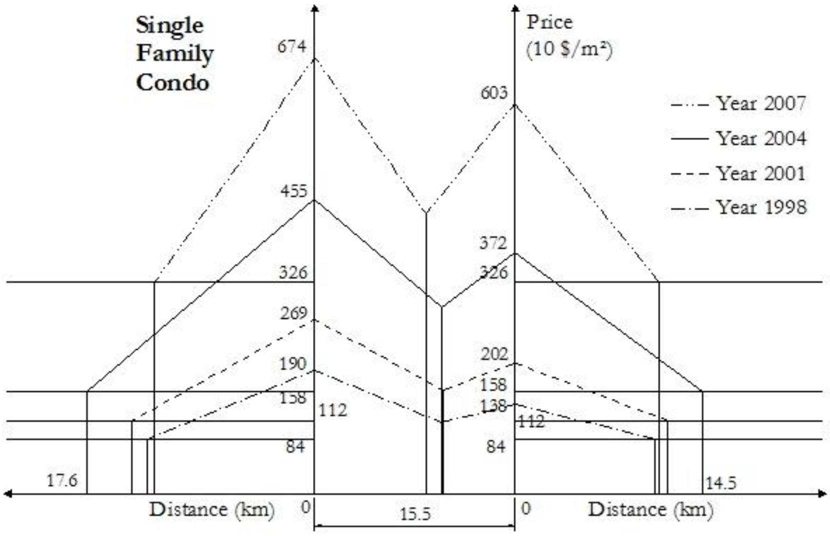


Figure 97 Changes of DR and AR proxies of condominium price in Los Angeles (CU-LD)

Two simple features can be observed in these diagrams. Firstly, the borders between the CU and LD submarkets show little change over time. Allowing for the fact that price data includes speculative factors, the small amount of change between borders implies that there have been similar rates of growth of employment in each spatial housing submarket. This is different from the case of Seoul, where the spatial submarket with a faster rate of employment growth merges into neighbouring spatial submarkets with slower rates of employment growth. The CU and LD submarkets maintain their independence in terms of spatial boundaries.

Secondly, the CU submarket shows slightly more dominance than LD submarket. Considering the fact that the LD submarket has almost double the amount of commuting inflow than the CU submarket[105], this dominance of CU over LD seems to be opposite to the expected result. There are various factors underlying this seemingly unexpected dominance. Firstly, a desire to avoid living near a huge office block or industrial work can be one reason. The CU spatial submarket incorporates areas of UCLA, Century city, and Beverly Hills. Employment in the CU spatial submarket is mainly based on the university, local authorities like the City of Los Angeles, and retail. On the other hand, the LD spatial submarket incorporates the main office blocks of LA downtown, whose employment is mainly based on large offices and industrial works adjacent to the office blocks. Second, the different composition of residence in terms of

[105] See table 21

ethnicity can be another reason. In terms of ethnicity of residents, the CU submarket is mostly occupied by Anglo-Whites whereas the LD submarket has a considerable proportion of Black and Hispanic residents.[106] Although the properties have same structural features when organised by sectoral submarkets, there might be other factors of social features, like ethnic grouping, which can subdivide these sectoral submarkets further. These two factors may lead to the reverse dominance of CU over LD. These factors are magnified in this analysis, as price data reflects speculative aspect than real demand for residence.

The next two diagrams are the interactions and changes of the borders between the EL and CU submarkets.

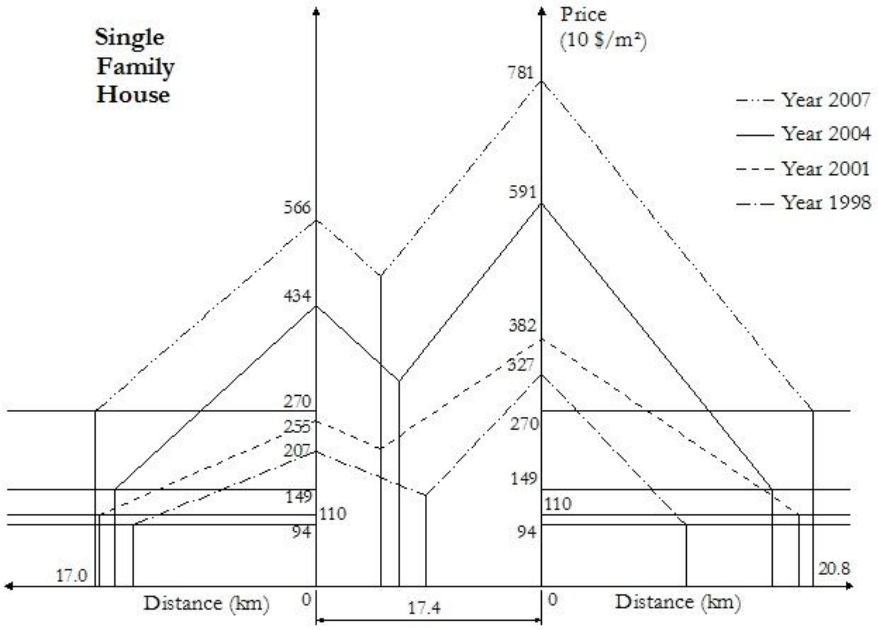


Figure 98 Changes of DR and AR proxies of house price in Los Angeles (EL-CU)

[106] Edward Soja et al. 1983

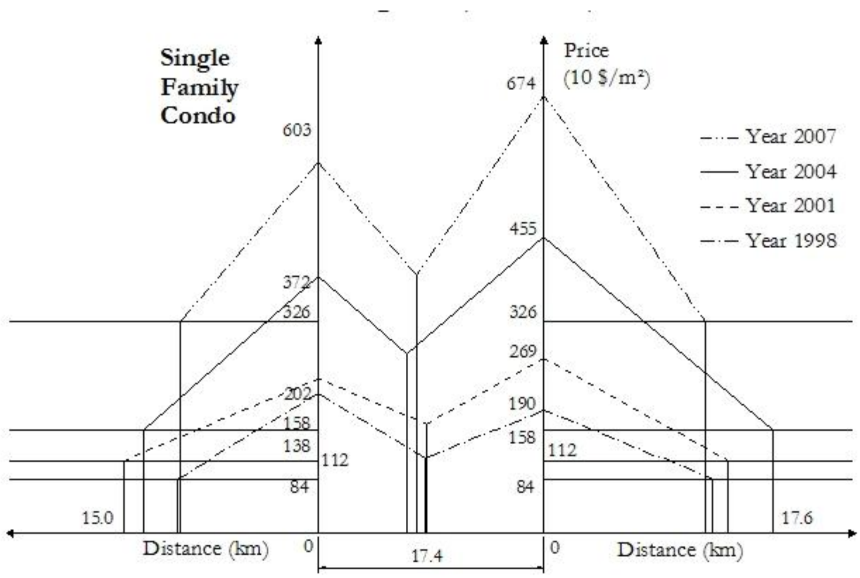


Figure 99 Changes of DR and AR proxies of condominium price in Los Angeles (EL-CU)

Two simple features can be observed from these diagrams as well. Firstly, the borders between EL and CU submarkets show little change over time.[107] This also implies that there have been similar rates of growth of employment in each spatial housing submarket. It can be said that the EL and CU submarkets maintain their independence in terms of spatial boundary.

Secondly, the CU submarket shows slightly more dominance than the EL submarket in the same way as the relationship between CU and LD. The commuting inflow of the employment centres of the two spatial submarkets are similar as Century City-UCLA-Beverly Hills has around 115,000 trips and El Segundo-LAX has 104,000 trips per day. The ethnic compositions are also similar as Anglo-White is dominant in both spatial submarkets.[108] One possible difference between the two spatial submarkets is the environmental condition. The EL submarket is based on the biggest international airport in the Western US. El Segundo is also adjacent to the largest sewage treatment facilities and oil refinery facilities in Los Angeles. These negative externalities of environmental factors might influence the dominance of CU over the EL spatial housing submarket in terms of house price.

[107] Gradient of single family detached house in CU submarket in 1998 is out of general tendency compared to others. It also affects the border between CU and other spatial submarkets. The borders of CU to other spatial submarkets in 1998 are assumed to be insignificant here.
[108] Edward Soja et al., 1983

Another interesting feature is that the dominance of CU over EL or LD is greater in detached houses than in condominiums. This can be interpreted as showing that the detached house market is more sensitive to the factors of social and environmental features of neighbourhood than the condominium market.

The next two diagrams show the interactions and changes of the borders between the EL and LD submarket.

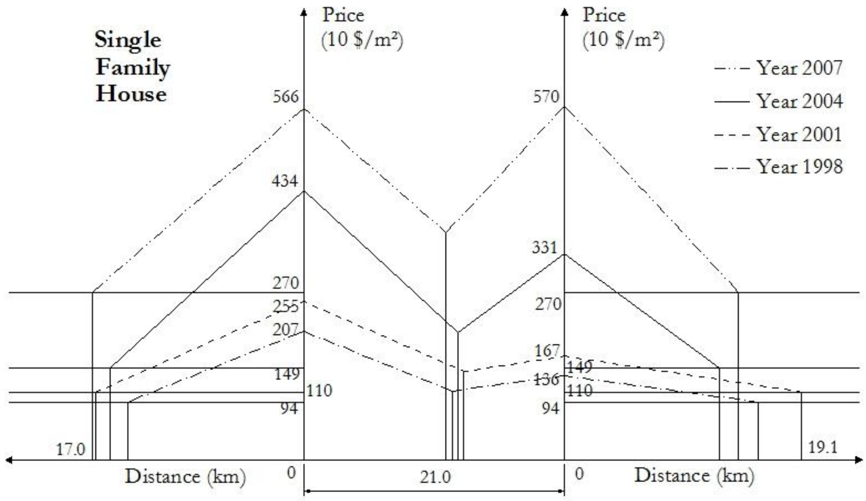


Figure 100 Changes of DR and AR proxies of house price in Los Angeles (EL-LD)

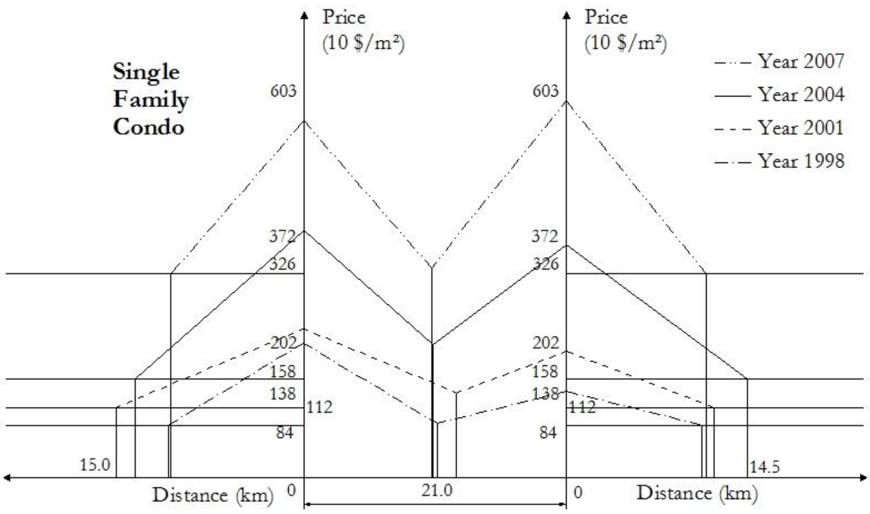


Figure 101 Changes of DR and AR proxies of condominium price in Los Angeles (EL-LD)

The independence between spatial housing submarkets is also observed in the EL and LD submarket. The little change in borders between the two and their independence implies that there have been similar rates of employment growth in each spatial housing submarket.

Given the greater commuting inflow to the centre of the LD submarket[109], the slight dominance of EL over LD seems to be contrary to expectations. As explained, both of the two spatial housing submarkets have negative externalities from environment and ethnic concentration. Based on the results of the analysis, it can be construed that in Los Angeles, ethnic concentration has a greater impact on the price of the housing market than environmental factors. More sensitive reflection of the negative externalities on the price of detached houses than on the price of condominiums is also found in the result of analysis between the EL and LD submarket.

7-6 Conclusion

This chapter investigated the structure of housing market in Los Angeles. Firstly, spatial and sectoral housing submarkets in Los Angeles were identified. 3 bedroom detached houses and 2 bedroom condominiums were selected as two representative sectoral housing submarkets in Los Angeles. The identification of spatial housing submarkets is based on two pieces of analysis: the mapping of commuting patterns and the embodiment of 2-D contours and 3-D surface shapes of house prices. Results of the analysis showed that Los Angeles is a polycentric city with multiple independent spatial housing submarkets. More than 15 areas, including Santa Monica, El Segundo-LAX, Torrance, Century City-UCLA-Beverly Hills, LA downtown, Long Beach, Pasadena, Santa Clarita, and Palmdale have their own distinct spatial housing submarkets. In this study, the three major spatial submarkets of Century City-UCLA-Beverly Hills [CU], LA downtown [LD], and El Segundo-LAX [EL] in the central area of Los Angeles county are analysed.

Secondly, a regression analysis was conducted to discover the contribution of accessibility to the centre of employment to house prices and the structure of land rents in housing market. The variable of accessibility as physical distance shows an explanatory power of around 14% in the detached house market and 30% in the condominium market. The gradients and 5th percentiles showed similar values and a similar pattern of changes over time.

[109] See appendix 7-3

Thirdly, the coefficients from the regression analysis were used to construct a diagrammatic model of the structure of house prices. The changes in DR and AR proxies over 10 years from 1998 to 2007 indicates that there has been significant increase in commuting cost and imbalance between demand and supply of housing across sectoral housing submarkets. In addition, two different patterns of changes in DR and AR proxies over time were observed. One is the increase in AR along with expansion of spatial housing submarket, and the other is the increase in DR without expansion of the submarket. The changes in DR and AR proxies also reveal that pressures of redevelopment of exiting residential properties may vary between sectoral housing submarkets and location of properties.

Fourthly, the interactions and changes between spatial submarkets of CU, LD, and EL were investigated. The findings are as follows. First, each spatial submarket maintains its own independence as the borders between spatial submarkets show little change over time, which can be supported by the fact that the rates of employment growth in the three spatial submarkets have been similar over the period. Secondly, the dominances of the CU submarket over the LD and EL submarket are observed. This can be explained by the differences of the social and environmental features of neighbourhood by area in Los Angeles. Thirdly, the dominance of CU submarket over EL or LD submarket is greater in the sectoral housing submarket of detached houses than condominiums. This demonstrates that the detached house market is more sensitive to the factors of social and environmental features of neighbourhood than the condominium market.

In spite of the limits of analysis from an alternative use of price data, and the imperfectness of regression fit in terms of explanatory power, there are some unique and positive contributions in this empirical study. Firstly, the combined use of mapping commuting patterns and the embodiment of the shape of house price is suggested as a useful solution to the complicated problem of the identification of spatial housing submarkets. Secondly, the method of diagrammatic modelling based on the regression analysis of house prices can be a useful tool for investigating the structure and the dynamic movements of land rents in an urban area.

Chapter 8.

Conclusion

8-1 The relationship between land and production

This study began with the question of the lack of a fundamental explanation by mainstream neoclassical urban economics for various dynamic phenomena in the housing market, despite its simplicity and considerable power of description. A desire to understand the reasons behind the movement of house prices and the capital investment on the built environment has led this study to the root of urban economics, land rent theory. The monopolistic power of landed property and the inseparable relationship between production and land is the most fundamental basis of land rent. Neoclassical urban economics has lost the focus on the relationship of land to production during its development for simple modelling.

Marxian land rent theory is based on the core relationship between land and production, integrating land rent theories of classical political economy. The theory encapsulates various issues and debates which had consistently remained unsolved among land rent theories in classical political economy and tries to synthesise them into one consistent theory. Nevertheless, the development of Marxian land rent theory has not been significant enough to be yet an alternative analysis of various urban phenomena. On top of the incompleteness of the theory itself, there have been some crucial misunderstandings of the theory and the lack of empirical analysis, which has retarded its development. It is undeniable that Marxian land rent theory at this stage is not a perfect tool for analysing the spatial structure or social relations of the housing market. In order to develop Marxian land rent theory, as a first priority it is necessary to clarify misunderstandings over the nature of the product of the land. The theory, which was based on an agricultural context, then has to be renovated to be suitable for an urban context. A successful development of Marxian land rent theory, without losing its emphasis on the production phase, can not only supplement some of the limitations of the neoclassical urban economists' approach, such as its descriptive and static nature, but also provide a useful framework within which to understand the dynamic movements of land rent and the corresponding movements of capital and their links with the process of reproduction of labour power.

8-2 Summary of main conclusions

Throughout the theoretical analysis in this thesis, there has been an attempt to establish a consistent land rent theory in an urban context. Initially, the product of the land in an urban context was reviewed. The relationships between the four categories, differential rent, differential rent 2, absolute rent, and monopoly rent were then reviewed for an urban context.

Major findings in the theoretical analysis are as follows.

1. The product of the land from production in a residential space is suggested to be labour power. The product of the land is often misconceived as buildings. However, it is more appropriate to regard buildings as a type of fixed capital in an urban context. The view on the product of the land as labour power enables us to understand the relationship between the use of space in residential land and the reproduction of labour power in terms of commuting and differentiated preference for groups of housing.

2. The difference in commuting cost due to locational advantage could be transformed to a part of differential rent in a residential area. The surplus of savings in commuting cost from the locational advantage of land could be appropriated by landowners as differential rent. Thus, location differences in a residential area differentiate the reproduction cost of labour power, and the savings in commuting cost from the reproduction of labour power could be transformed to a part of differential rent in an urban context.

3. It has been suggested that the source of absolute rent is a particular economic condition which allows lessees to earn excess profit from using land. This particular condition also benefits landowners, by enabling them to demand this part of the excess profit from capitalist tenants as absolute rent. The technical condition of low organic composition of capital for the existence of absolute rent in a sector assumes that the rent can arise only when landed property can block additional capital investment on marginal land in the sector where there is excess surplus value over the price of production. This should therefore satisfy the condition that the rent must come from the surplus value produced in the sector. However, this technical condition for an existence of absolute rent may be inappropriate as the flow and mixing of surplus value across all sectors can be hardly blocked by any barriers due to the ever greater mobility of capital in the contemporary capitalist mode of production. What enables the appropriation of absolute rent under landed property is a favorable economic condition in a sector creating excess profit which makes capitalist tenants use the spaces in spite of the rent rather than the condition of low

organic composition of capital in the sector.

4. Given that the technical condition of low organic composition of capital is discarded in explaining absolute rent in an urban context and it is determined by external economic condition, the concepts of monopoly rent and absolute rent seem to be indistinguishable. The possible yardstick which can be used to differentiate them is whether the monopolistic rent is solely appropriated in a particular space or commonly in a group of similar spaces. When a particular space monopolises and bears monopoly rent, other capitalists are likely to launch similar spaces in order to share the monopolistic rent if they can. As a consequence, this emulation would form a group of spaces and the group would share a similar amount of rent which can be seen as absolute rent. Capitalist developers, at the same time, may try to differentiate their land to appear unique to allow the sole appropriation of monopoly rent. These two processes would result in various groups of housing.

5. The concept of differential rent 2 is related to the differentiation and emulation of spaces for monopoly rent and absolute rent, as the two processes necessarily require additional investment on the land. Given differential rent 2 as the gap between rents before and after the extra capital investment, it can be seen as a transitional and temporary category of rent which is eventually transformed or consolidated to other forms of rent. If the investment succeeded to make a space unique creating monopoly price, the actual form of differential rent 2 would be monopoly rent. If it succeeded to make a space similar to existing monopoly rent-bearing land so that it could share in the excess profit, a combination of absolute rent and differential rent in the sector where the space entered would be the actual form of differential rent 2.

6. As a city expands with the growth of employment and population, it is very likely that ring-shaped residential belts of different types of housing would surround the centre of the city. The fixity and durability of buildings would result in different groups of housing which would have been built in different times. Each group of houses would have a different level of absolute rent as a sector and differential rents in the sector, which makes multiple levels of potential combinations of absolute rent and differential rent in a piece of land. This difference of potential land rents in one site is one of the most dynamic impetuses of regeneration in urban areas. Location differences in a group of housing would contribute to differential rent, while preference differences for the reproduction of labour power between groups of housing would contribute to absolute rent. Differential rent within a residential area and absolute rent by each group of houses and its associated implication to the reproduction of labour power should be an

integral part of the analysis of the structure of land rent in an urban area.

After the introduction of the necessity of the division of submarkets by residential spheres, which have their own employment centres and surrounding residential areas, the dynamic processes of expansion-overlap-merger of residential spheres were analysed. This interaction between residential spheres is vital to the understanding of the landscape of multiple residential spheres in an urban area. Commuting patterns are thus crucial to the understanding of the structure and interaction between residential spheres. As the housing market is under the influence of a dominant centre of employment and the associated dominant residential sphere to which it belongs, the housing market needs to be divided into spatial housing submarkets according to the shape of the whole housing market and the commuting pattern. As the dominant housing types built in successive periods of time are different, the housing market is also differentiated by housing types, which form the main constituent of structural housing submarkets. In addition to this, social and environmental features such as aggregation by class, ethnic concentration or income level, and uneven distribution of educational, amenities, andother facilities distinguish certain groups of housing. In this context, analysis of the housing market should be conducted by spatial and sectoral housing submarkets.

The dynamic movements of land rents and the consequent movements of capital in the space *within* a housing submarket fall into three categories: 1) when commuting costs increase due to some reason, such as an increase of transportation fare following an increase of oil price, or an increase in time costs due to traffic congestion; 2) when an imbalance of supply and demand for a certain sectoral housing submarket is aggravated by factors such as increased preference or limited stock; and 3) when employment grows and a housing submarket expands to accommodate the housing demand from the increased labour force in the housing submarket. The dynamic movements of land rents and resulting movements of capital in the space *between* housing submarkets are also highlighted: 1) the existence of different sectoral housing submarkets in a space provides the major impetus of regeneration in the city, and 2) the changes in economic condition due to supply and demand in a housing submarket would perpetuate the movement of levels of land rents in other housing submarkets, which will be followed by capital investment in these spaces.

The empirical analysis in this study is based on these criteria of division in housing submarkets. The results from the analysis reveal the existence of multiple levels of land rents in space and dynamic movements of land rents over time in different cities.

The three cities of London, Seoul, and Los Angeles were selected for empirical analysis to verify the structure of land rents and investigate dynamic changes. London is selected as a classic type of a monocentric city, Seoul as a tricentric city, and Los Angeles as a polycentric city. In addition to this, the three cities are located in the three different regions of Europe, Asia, and North America; they are all metropolitan cities with populations of 10 million each. Analysing the three metropolitan cities with different spatial and contextual structures can validate the theoretical findings on the structure and dynamics of land rents in an urban context.

For a subdivision of spatial housing submarkets, two methods are adopted. Firstly, commuting patterns are mapped. The commuting pattern represents the spatial relationship of residential spheres to places of work. Examining commuting flows focusing on their directions one area to others can be a crucial criterion in identifying spatial housing submarkets. A piece of network analysis software called Pajek produces maps which show the relationships of multiple areas with commuting flows. A set of commuting data of origin-destination by local authority can thus be converted to a readable map of commuting flows between them. Secondly, 2-D contours and 3-D surfaces of house prices are examined. As the location of houses does not exist in the form of a surface but as points, embodying house prices needs to be based on the interpolation of house prices in unknown points from house prices in known points. In constructing the house price surfaces of a city, a method of stratified sampling by local authority is used. The associated data for each sample house is then collected. In order to control the variance in house prices from structural characteristics, a couple of dominant groups of houses which have the same building type, the same number of bedrooms, and the same number of bathrooms are selected. For the same reason, house prices are used in the form of house price divided by floor area. A piece of GIS software, Surfer, produces 2-D contours and 3-D surfaces of house prices in a city to represent house price data by location. The house price surfaces might not be enough to establish spatial housing submarkets in a city because they are also affected by various factors other than accessibility to the centre of employment, such as educational facilities, the environmental condition, and the neighbourhood characteristics. It should be double-checked with the commuting pattern.

The major findings from the empirical analysis on the three cities of London, Seoul, and Los Angeles are as follows. Firstly, spatial and sectoral housing submarkets have been identified based on the analysis of housing submarkets. In London, 3 bedroom houses and 2 bedroom flats were selected as two representative sectoral housing submarkets. The identification of spatial housing submarkets is based on two types of analysis: mapping commuting patterns and the embodiment of 2-D contours and 3-D surface cones of house price. Results of the two types of analysis showed that London consists of one merged spatial housing submarket centring on Westminster. In Seoul, 2 bedroom apartments, 3 bedroom apartments, and 4 bedroom apartments were selected as three representative sectoral housing submarkets. The combined use of two methods of identification of spatial housing submarkets showed that Seoul consists of a half-merged unity of three different spatial housing submarkets. The major three spatial housing submarkets are GangNam-SeoCho(GS), Joong-JongRo(JJ), and YoungDeungPo-GooRo(YG). In Los Angeles, 3 bedroom single family detached houses and 2 bedroom single family condominiums were selected as two representative sectoral housing submarkets. The two methods of identification of spatial housing submarkets showed that Los Angeles is a polycentric city with multiple independent spatial housing submarkets. Santa Monica, El Segundo next to Manhattan Beach, Torrance, Century city-UCLA-Beverly Hills, LA downtown, Long Beach, Pasadena, Santa Clarita, and Lancaster–Palmdale all have their own distinct spatial housing submarkets. In this study, the three major spatial submarkets of Century City-UCLA-Beverly Hills [CU], LA downtown [LD], and El Segundo-LAX [EL] in the central western area of Los Angeles county are analysed further.

Secondly, regression analysis was conducted to discover the contribution of accessibility to the centre from spatial housing submarkets to the level of house price and the structure of land rents in the housing market. Accessibility to the centre and house price shows a negative relationship, which is consistent with the traditional concept as perceived across all cities. In London, both of the accessibility variables of physical distance and commuting time show a similar level of explanatory power for each sectoral housing submarket. The variance in the accessibility explains around 32% of the variance in house prices and around 45% of flat prices. In Seoul, the variance in the accessibility variable of physical distance to the centre of each spatial housing submarket explains around 55% of the variance in the prices and 63% of the rent levels of apartments across all sectoral submarkets. In Los Angeles, the accessibility variable of physical distance to the centre of each spatial housing submarket has an explanatory power of around 14% in the detached house market and 30% in the condominium market. The gradients and 5th percentiles showed similar values and similar patterns of changes over time across all cities.

Thirdly, the coefficients from the regression analysis are used to construct diagrammatic models of the structure of house prices. The changes of differential rent (DR) and absolute rent (AR) proxies over a period of 10 years (from 2000 to 2009 in London, and from 1998 to 2007 in Seoul and Los Angeles) are examined. The diagrams of DR and AR proxies indicate that there have been significant increases in commuting costs including time cost and imbalances between demand and supply of housing across sectoral housing submarkets in all three cities. Two different patterns of changes in DR and AR proxies over time are observed. One is an increase in AR along with an expansion of spatial housing submarkets, and the other is an increase in DR without an expansion in spatial submarkets. The changes in DR and AR proxies also reveal that the pressure for redevelopment of existing residential properties to replace units in one submarket by another may vary across different sectoral housing submarkets and by the location of properties. The biggest changes in land rent proxies around 2003 are the changes in the gradients of the lines of DR proxies across all submarkets in all three cities. This indicates that there has been an increase in commuting costs, which can be explained by an increase in oil prices in the period. The changes in land rent proxies in other periods are mainly due to changes in AR proxies which imply changes in economic conditions in the labour and housing markets, speculations about a future change, or changing interest rates. The degrees of changes in AR proxies vary with city. Within each city, however, there are only small differences in the changes in AR proxies across sectoral housing submarkets. Los Angeles shows the greatest change in AR proxies with up to 300% increase over 10 years with 35% inflation, while London showed 100% with 19% inflation and Seoul showed 50% increase with 28% inflation. Given the minor change in interest rates over the whole period and the fact that the degree of change is far beyond the probable change in the real housing market of supply and demand, this increase of AR proxies in Los Angeles seems to be mainly caused by speculation. The changes in AR proxies in Seoul showed 20% real increase in the sales market and 10% real increase in the rental market, which indicates that speculation is less influential in the rental market.

Finally, the interactions and the changes between spatial submarkets are investigated in Seoul and Los Angeles, where there are distinct spatial housing submarkets. In Seoul, at least until 1998, the city had three spatial submarkets of JJ, YG, and GS. Spatial analysis before this period in Seoul should regard the city as having comprised different spatial submarkets with three different centres. Since 2004, Seoul has only one spatial submarket, as the GS submarket merged with the other two submarkets during the period. Spatial analysis after this period should regard the city as one merged spatial submarket with one centre of GS. The interaction between JJ and YG after the merger by GS after 2004 have little significance in the structure of housing market as a whole, as both of them lie under the influence of the GS submarket. The status of the merge would continue permanently as long as employment growth of GS continues to exceed those of JJ and YG. As a result of the merge between spatial submarkets in Seoul, the total land rent attribute would rise significantly more than before the merge. In Los Angeles, each spatial submarket maintained its own independence as the borders between spatial submarkets appear to remain constant, which can be supported by the fact that the rates of growth in employment in the three spatial submarkets have been similar over the entire period. It is possible to observe the dominance of the CU submarket over the LD and EL submarkets. This can perhaps be explained by the difference in social and environmental features in different areas in Los Angeles. The dominance of the CU submarket over the EL or LD submarkets is greater in the sectoral housing submarket of detached houses than that of condominiums. From this, it is possible to interpret that the detached house market is more sensitive to the factors of social and environmental features than the condominium market where employment access is relatively stronger.

8-3 Strengths and limitations

This thesis tried to develop a consistent land rent theory for an urban context on the basis of advances in land rent theory of political economy focusing on the relationship between land and production. There are several elements in this theorisation. An identification of the product of the land in an urban context as labour power enables further appropriate analysis of land rents in the housing market. The controversial issue over the condition of absolute rent is discarded for a contemporary urban context where ever-greater mobility of capital incapacitates the power of landowners on the barriers to capital movement. The relationship between absolute rent and monopoly rent is suggested through the concepts of the *emulation* and *differentiation* process with competition between property development capitals. The reality of differential rent 2 in an urban context is explained with the motivation of capital investments on spaces. Finally, a general structure of land rents as a combination of absolute rent and differential rent is suggested. This enables the understanding of the existence of multiple layers of potential land rents in an urban space and the motivation for redevelopments of spaces in the gaps between the layers of land rents.

The process of expansion-overlap-merger of multiple commuting spheres to form a merged structure of land rents is explained on the basis of the concept of a residential sphere. This can be extended to an appropriate understanding of the concepts of subcentres and policentricity in a city. The relationship between the level of land rents and the ensuing commuting pattern changes can be the basis of the subdivision of the housing market into spatial housing submarkets. This process has been verified through empirical analysis in the two cities of Seoul and Los Angeles over time (London having been dominated by a single centre already when the study started). The changes of the structure of the housing market in Seoul over 10 years from 1998 to 2007 demonstrate the process of the merge between different residential spheres particularly acutely.

A diagrammatic analysis of land rents over time based on regression analysis made it easier to understand the structure of land rents in the housing markets and the dynamic changes in the land rent proxies. The changes in absolute rent and differential rent proxies from the diagrammatic analysis enabled more appropriate interpretations of the causation of the changes in land rents, such as the change in commuting costs and the imbalance of demand and supply of housing in a certain housing submarket.

Land rent theory has been applied to the three cities of London, Seoul, and Los Angeles which all exist in different contexts and all have different structures of distribution of employment centres. With an appropriate subdivision of the spatial and sectoral housing submarkets, it has been recognised that there exists a general structure of land rents comprising absolute rent and differential rent proxies in cities in different contexts.

This study tried to bridge the gaps between classical land rent theory and urban land rent in the housing market which are segmented into multiple submarkets. This study also tried to verify the structure of land rent derived from the theoretical analysis in the empirical research and get implications from it. This study managed to suggest and find a general structure of land rent based on classical rent theory focusing on the reproduction process of labour power when a whole housing market is subdivided into appropriate submarkets. However, admittedly, it is undeniable that the study was too ambitious to examine the full extent of scopes it went through. The limits of this study should be properly filled with advances in future studies.

First of all, land rent is assumed to be the excess profit due to the contribution of the land regardless of whether it is taken by landowners as rent or by capitalist tenants / capitalist landowners as excess profit. Although actual payments of ground rent vary between people, time, or market conditions, the concept of land rent is used as Smith's 'natural rent' which actual payments fluctuate around. For this reason, the dynamic struggles over the appropriation of the excess profit on land between various agents of landowners, developers and tenants are not fully discussed here.

Second, the increasing tendency of integration between landed and capitalist classes is not focused upon here. Capitalists can become landowners by buying land and in the same manner landowners can also be capitalists if they use their own land for production. Ordinary workers also lease land for various purposes including reproduction of their labour power. Although the actual relationships across land may vary, the separation between a lessor and lessee of land was maintained to make the renting relationships straightforward.

Third, this study focused on residential land in examining the structure of land rent in an urban context. The interaction of residential land with other uses of land in an urban context, such as commercial, industrial, and public use, is not dealt with here. The research on the interaction of housing market with office markets could make the analysis more substantial.

Fourth, this study focused on ordinary workers amongst various types of users in the housing market. Although pensioners or families valuing environmental and educational accessibility the most often play a pivotal role in formaiton of house price, the majority of spaces in urban rensidential land are occupied for the reproduction process of labour power of ordinary workers. In this context, the difference of commuting costs of ordinary workers is assumed as the major locational advantage of spaces. Whereas the accessibility to amenities, good schools and parks contributes to rent / house price locally, the accessibility to centres of employment contributes across the whole housing submarket. This view which regard the differnce in commuting cost as the major proxy of differential rent may bring the criticism of reductionist approach. Nevertheless it is still worth seeking a major factor to find a general framework. Other attributes to locational advantages would contribute to the detailed fabric.

There are also some limits in the empirical study. For empirical analysis, there are some problems which need to be clarified. The first problem is the availability of land rent data. All residential land is used in the form of a space which is created through a mixture of land and the buildings on it. Moreover, house rent makes no distinction between contributions for land and for buildings. Therefore, it is practically impossible to collect data for land rent. Data for house rent is the next best source for analysis of land rent, considering that the variation and absolute contribution from building to house rent is relatively smaller than that of the rent for the land; as

Smith argues, building rent can be distinguished from land rent as the sum of return from initial capital invested for a building and the depreciation cost. In this manner, the contribution from a building as house rent can be calculated to extract the level of land rents. However, the house rent data is also very limited as the rental housing stock is smaller than the owner-occupied stock and the rental data is generally not included in housing statistics. The most available data throughout regions and countries is house price data. Although it includes various noise factors, such as speculation on future price rises or falls, interest rates, and transaction costs, it can be used as alternative data to land rents, as the basic foundation of house price is normally assumed to be capitalised rent on space. For reasons of practical availability, this study employs house price data as its main data source, in spite of the various limitations inherent in using house price to replace land rent levels. The comparison of the results from price data and rent data, where rent data are available only in the analysis of Seoul, provides a meaningful analysis of the relationship between them.

Second, this study used 5th percentile as the minimum level of house prices in a housing submarket as absolute rent proxy. As there may be some extreme prices in the lowest group of prices, 5th percentiles assuming normal distribution are chosen as the value for the minimum instead of the actual lowest price. However, other values, such as 3rd percentiles or 10th percentiles may also be used as the reflection of absolute rent proxy. The sectoral division of housing submarket assumes the groups of similar housing type, size and neighbourhoods apart from locational differences. Given that locational differences is reflected in the diffences of house prices, another division of spatial submarkets enables to assume that the minimum level of house prices reflects the capitalised common rent as absolute rent as well as depreciation amount of building costs and price expectations in the submarket. The problem is that it is difficult to figure out each proportion of absolute rent and price expectiations in the changes in the minimum values.

Third, in regression analysis, this study used simple ordinary least squares model. This method is insufficient to find the fittest hedonic model of multiple attributes to house prices like hedonic price function model. However, this method is useful to focus on differential rent and absolutre rent when structural attributes of houses are controlled by separating sectoral housing submarkets. This method also enabled to construct diagrams of the structure of land rents using the values of coefficients and constants.

Fourth, this study assumed a constant marginal commuting cost for simplicity reasons. The assumption of the constant marginal commuting cost makes the rent curve linear. In realty, however, the marginal commuting cost is not constant. It tends to be higher in central area because time cost and external cost arise in central areas due to congestion. Exponential or other non-linear model of rent curve is then more realistic.

The fifth limit is the use of physical distances as a measure of accessibility to employment centres. Although physical distances to the centres roughly correspond with commuting costs, the actual commuting costs through various modes of transportation, including time costs, would be the best measure of accessibility. In the analysis of the structure of the housing market in London, commuting time was used as an alternative measure to physical distances to the centre. It shows slightly better explanatory power than when using the measure of physical distances. In the other two cases, time estimates were not available.

The sixth problem is the division of sectoral housing submarkets. In theory, there could exist hundreds of sectoral housing submarkets, divided by structural characteristics, social neighbourhood characteristics, and institutional characteristics. This study focuses on sectoral housing submarkets based on structural factors such as dwelling type, number of bedrooms, number of bathrooms, and the range of floor area. The most dominant types of sectoral housing submarkets based on structural features are selected for empirical analysis. As is revealed in the analysis of the structure of housing market in especially Los Angeles, social and environmental features also affect the division of sectoral housing markets.

The seventh limit is the division of spatial housing submarkets. In reality, a metropolitan city has multiple cores of employment, although it is common to assume that a city has only one dominant centre of employment. Some of these multiple centres are main centres and others are sub-centres and it is for employers at these various centres that labour power needs to be reproduced. As accessibility to an employment centre is one of the major factors determining the level of differential housing rent in an urban context, a proper subdivision of spatial housing submarkets is the most crucial and, at the same time, the most difficult process in the empirical analysis. This study used commuting patterns and the shape of house prices in a city as the major criteria for the spatial division. As commuting patterns and the shape of house prices changes over time, the division of spatial housing submarkets should be also re-defined over time. However, commuting data for mapping commuting patterns is normally created by Census data, which is collected every ten years. Many parts of the subdivision of spatial housing submarkets in this study have to employ commuting data from the past.

The eighth limit is the difficulty of setting the location of the centres of each spatial housing submarket. As centres of employment exist in the form of a cluster rather than a point, because of the merger process, establishing a centre of each spatial housing submarket from a central block or a cluster is inevitably rather arbitrary.

The extension of these limits through further work would enhance the relevance and enrich the implication of this study.

8-4 Future studies

Applying this framework of analysis of land rents to other metropolises in various contexts could be interesting. Investigating the structures and changes of land rents over time in metropolises such as New York, Chicago, Paris, Tokyo, Beijing, and Shanghai could not only fortify the general relevancy of the frame of land rent theory for an urban context but also provide an opportunity to incorporate various extra factors into the analysis. It could be a meaningful work to interpret and compare the structures of land rents in terms of labour reproduction in each city.

The speed and the extent of growth of residential spheres vary with levels of employment growth and the interactions between other neighbouring residential spheres. The process of expansion-overlap-merger between residential spheres could be simulated using agent-based modelling. The simulation could demonstrate how multiple residential spheres develop into a few dominant residential spheres in merged form, which is the prevailing form of metropolises with multiple centres of employment. The modelling can be based on the principle that 1) each employment centre has to accommodate commuters surrounding it forming a residential sphere; 2) residential spheres grow and overlap with other neighbouring residential spheres; 3) the relative dominance between residential spheres are determined by the scale of employment and the number of commuters to the centre, which is regulated by differential land rent reflecting commuting savings depending on the location of the commuters; and 4) employment growth in merged residential spheres is reflected in the total employment growth in the merging residential sphere.

The *differentiation* process seeking monopoly rent and the *emulation* process seeking absolute rent are the major impetus for capital investment on land that changes the landscape of an urban area. An empirical analysis of the newly-created type of housing and the following construction of similar houses would verify the prevalence of these processes in an urban area. It would be a substantial piece of work to demonstrate the genesis of the general structure of land rents to track the changes in the level of rent from the moment when a newly developed housing enjoys its monopolistic status until the moment when multiple houses sharing similar level of rent form a sectoral housing submarket and eventually when differential rents are generated by the location differences within the sectoral housing submarket.

As there exist multiple layers of potential land rents in a piece of land, the rent gap between the current use of a space and the maximum potential use of the space varies with the location in an urban area. Constructing the layers of potential land rents by sectoral and spatial housing submarkets can reveal the rent gaps by location. This work could subsequently reveal the most heavily exposed areas to the pressure for redevelopment for acquiring the rent gap as a profit in return. This could also cast light on the gentrification process, adding precision to the 'rent gap' concept as used by Smith (1979).

8-5 Policy implications

Some policy implications can be drawn from this study. An analysis on the structure of land rents in an urban area naturally connects to the question of how they increase and how they can be reduced. The factor that makes land rents greater is the differences in commuting costs within a housing submarket and the different economic conditions between housing submarkets. Governments may try to reduce the level of land rents either by reducing commuting costs or by easing economic imbalances of supply and demand between housing submarkets. These can be achieved through various measures, such as reducing public transportation cost and congestion, adding new infrastructure or increasing the supply of specific types of housing where demand exceeds supply. Governments can also influence the location of employment growth.

The spatial structure of land rents by distribution of employment centres leads to the issue of the sustainability and competitiveness of a city or of the employers within it. The expansion of neighbouring residential areas by growth in employment would lead to overlap and merger between the areas, resulting in a higher level of land rents than in the situation where employment centres were located at a distance. In the same manner, the growth of employment in dominant residential area without dispersing employment to outer areas would lead to an increase in the level of land rents and consequently in house prices. As a result, the average distance and commuting costs would also increase with the dominance of a few employment centres. Given the same scales of employment, a monocentrically structured urban area has a higher level of land rent, longer commuting distances, higher commuting costs, and more congestion than a polycentrically structured urban area. By the criteria of sustainability such as waste of time and energy from congestion, a polycentrically structured urban area is more desirable than one with a monocentric structure. In terms of competitiveness of a city, higher land rents would lead to more expensive office leases, and it would be more expensive to employ workers as commuting costs and the burden of higher living costs in the city would be reflected in the wages. In spite of the existence of economies of agglomeration to a certain level, this would be a negative factor to a city in terms of competitiveness. A government's efforts to disperse employment to outer areas can ease this problem of over-concentration.

The structure of land rents reveals the social aspects of land rent. The formation of core areas of employment and the ensuing construction of houses inevitably leads to a lack of available spaces near the centre of a city. In addition, the different economic conditions of supply and demand across different housing submarkets are the result of social need and provision. Moreover, a regulatory power, such as the planning authorities, determines land use and possibly even the intensity of land use, which subsequently determines the level of land rents. The varied provision of transportation and infrastructure by the government changes accessibility to the centre in the affected areas, and this will also be reflected in the change of land rents. In many cases, the provision of educational facilities or amenity facilities like parks changes the level of land rent in many areas. These all confirm the social aspect of land rents in an urban area. Therefore, an increase in land rents needs to be controlled by a government. Furthermore, a government may impose various types of windfall tax on the increase in land rents on the basis of the concept of the public ownership of the development rights of a piece of land. The more accurate the analysis on the spatial structure of land rents, the more justifiable this tax becomes.

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Appendices

Appendix 3-1 Organic composition of capital in absolute rent bearing sector

If there were a barrier against capitalist investment due to an existence of absolute rent (AR) in a sector, the organic composition of capital (OCC) in the sector would be lower than those in others. This could be proved by the following way.

1) If the rates of profit of AR-bearing & non AR-bearing sector are the same and AR is included in cost of production, rates of profit in the two sector can be written as the following.

$$\text{Rate of profit} = Sa/(Ca+AR+Va) = Sn/(Cn+Vn) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

(a: AR-bearing sector, n: non AR-bearing sector, S: surplus value, C: constant capital, V: variable capital)

If the left hand side is divided by Va and the right hand side is divided by Vn, (1) can be written as the following.

$$[Sa/Va] / [(Ca+AR)/Va + 1] = [Sn/Vn] / [Cn/Vn + 1] \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

2) If exploitation rates (S/V) are the same in both sectors, (2) can be written as the following.

$$1 / [(Ca+AR)/Va + 1] = 1 / [Cn/Vn + 1] \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

(because $Sa/Va = Sn/Vn =$ exploitation rate)

By making the both sides reciprocal, (3) can be written as follows.

$$(Ca+AR)/Va + 1 = Cn/Vn + 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

$$(Ca+AR)/Va = Cn/Vn \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

To make (5) valid, Ca/Va should be less than Cn/Vn.

Therefore, the OCC of AR-bearing sector (Ca/Va) is lower than the OCC of non AR-bearing sector (Cn/Vn).

Appendix 5-1 Sample data of London (summary)

Table 25 Sample house data of London (summary)

Variable	Unit	Number of obs.	Mean	Std. dev.	Min.	Max.	Percentiles (%) 10	25	50	75	90
Floor area	m^2	315	1,049.6	168.1	812.0	1,900.0	871.0	934.0	1,018.0	1,145.0	1,252.0
Distanceǂ	km	315	19.2	10.4	1.4	55.2	6.1	11.5	18.0	26.3	34.6
Time1*	min.	261	58.2	20.7	15.0	135.0	33.0	44.0	57.0	70.0	84.0
Time2**	min.	261	54.6	18.7	14.0	110.0	31.0	42.0	55.0	66.0	76.0
Time3***	min.	261	3.5	4.1	1.0	40.0	1.0	1.0	2.0	4.0	6.0
Price 2000		176	353.1	175.9	143.1	1,492.1	211.2	259.0	315.7	389.8	501.6
Price 2001		201	391.8	165.9	152.1	1,601.6	256.8	294.4	356.0	439.0	554.5
Price 2002		189	448.2	182.5	181.0	1,444.6	289.8	335.7	412.7	497.6	674.8
Price 2003		164	507.6	181.4	179.6	1,761.7	355.0	402.1	474.1	557.4	690.0
Price 2004	10	174	563.7	265.6	195.7	2,486.7	370.5	427.5	515.0	599.5	796.9
Price 2005	$/m²	160	568.5	219.6	284.3	1,957.1	386.2	448.6	525.5	614.1	809.3
Price 2006		193	615.0	241.7	282.6	2,054.6	408.5	465.5	560.5	689.9	905.9
Price 2007		201	710.8	374.2	285.5	2,781.7	444.7	517.3	609.3	739.2	1,108.4
Price 2008		134	680.3	357.0	324.0	3,150.1	443.6	500.3	584.9	742.0	1,019.3
Price 2009		315	718.3	377.7	264.8	3,075.5	437.4	522.3	607.7	764.7	1,149.4

ǂ distance to main centre of employment

* commuting time (total) ** commuting time (travel) *** commuting time (waiting)

Table 26 Sample flat data of London (summary)

Variable	Unit	Number of obs.	Mean	Std. dev.	Min.	Max.	Percentiles (%)				
							10	25	50	75	90
Floor area	m^2	316	627.9	83.7	460.0	1,001.0	530.0	564.0	620.0	676.0	737.0
Distance ǂ	km	316	19.0	10.5	1.3	54.7	5.7	11.4	17.5	26.0	34.3
Time1*	min.	256	55.6	18.6	16.0	120.0	30.0	43.5	55.0	68.0	79.0
Time2**	min.	256	52.4	17.0	15.0	105.0	28.0	41.0	52.0	65.0	74.0
Time3***	min.	256	3.2	2.8	1.0	20.0	1.0	2.0	3.0	3.0	5.0
Price 2000	10 \$/m^2	203	371.6	152.4	136.0	1,567.0	236.3	280.3	331.6	441.3	538.2
Price 2001		200	406.8	140.6	174.9	897.0	255.4	305.1	373.5	488.2	613.4
Price 2002		196	478.1	159.4	198.2	1,408.4	326.8	368.3	453.7	546.2	692.0
Price 2003		207	549.5	157.7	268.7	1,689.6	385.2	444.1	525.5	629.7	733.9
Price 2004		224	585.0	161.0	276.8	1,431.9	424.8	475.5	560.1	660.6	777.7
Price 2005		193	607.3	179.3	325.2	1,871.2	432.1	499.8	572.1	668.7	848.2
Price 2006		214	645.8	219.4	316.2	1,853.1	438.7	505.0	599.9	720.4	902.7
Price 2007		235	740.3	270.9	370.4	2,139.2	488.3	566.0	664.5	837.2	1,057.4
Price 2008		173	731.9	276.0	301.1	2,033.6	505.5	578.4	651.0	816.0	1,056.0
Price 2009		316	733.9	275.7	317.0	2,014.1	487.8	561.8	654.6	809.1	1,073.3

ǂ distance to main centre of employment

* commuting time (total) ** commuting time (travel) *** commuting time (waiting)

Appendix 5-2 Sample data of London

Table 27 Sample house data of London

		Street	Post code	Bed-room	Bath-room	Recep-tion	Floor area‡	Type*	Price (10 US $/m²)										Longitude				Latitude			
									2009	2008	2007	2006	2005	2004	2003	2002	2001	2000		°	`	``		°	`	``
1	EC1	St John Street	EC1V 4LY	3	2	1	1481	t	1090					1160					W	0	6	17	N	51	31	32
2	EC2	Holywell Row	EC2A 4JB	3	2	1	1810	t	899.5						605	525			W	0	4	57	N	51	31	22
3	WC1	Lloyd Baker Street	WC1X 9AB	3	2	2	1809	t	1250	1040					395			241	W	0	7	45	N	51	31	40
4	WC2	Endell Street	WC2H 9AJ	3	3	1	1900	t	1850										W	0	7	32	N	51	30	54
5	N1	Halliford Street	N1 3HD	3	2	1	1367	t	780					451					W	0	5	25	N	51	32	25
6	N2	Elm Gardens	N2 0TF	3	2	2	1020	s	575				360	395			263.5	240.5	W	0	10	34	N	51	35	31
7	N3	Hamilton Way	N3 1AN	3	2	1	1350	t	445		457		366		340	270	288		W	0	11	38	N	51	36	32
8	N4	Ambler Road	N4 2QS	3	2	2	1279	t	649.5	664				515		410			W	0	6	13	N	51	33	39
9	N5	Elfort Road	N5 1AX	3	3	2	1352	t	645	717	570	517			342	371	341	335	W	0	6	19	N	51	33	24
10	N6	Orchard Road	N6 5TR	3	1	2	1233	t	635			526	467.5	381		285	224		W	0	8	29	N	51	34	31
11	N7	Tavistock Terrace	N19 4BZ	3	2	2	1560	t	760	635	725	540		557	500				W	0	7	35	N	51	33	39
12	N8	Effingham Road	N8 0AE	3	1	2	1184	t	465	440			291	275	227.5				W	0	6	8	N	51	35	6
13	N9	Tranmere Road	N9 9EJ	3	1	1	962	s	250	210	237	205				160		118	W	0	4	7	N	51	38	0
14	N10	Pembroke Road	N10 2JD	3	2	1	1085	t	375			350				250	186		W	0	8	48	N	51	36	10
15	N11	Queens Road	N11 2QP	3	2	2	989	t	340		265		228			195	160		W	0	7	18	N	51	36	28
16	N12	Birkbeck Road	N12 8DZ	3	1	2	969	t	400		370		304			250	175		W	0	10	53	N	51	36	48
17	N13	Melbourne Avenue	N13 4SX	3	2	2	1043	t	320		320	325	262			250	210	192	W	0	6	42	N	51	36	40
18	N14	Mayfair Terrace	N14 6HU	3	1	2	1077	s	375	327		355			317		240		W	0	7	33	N	51	38	9
19	N15	Roslyn Road	N15 5JB	3	2	1	1012	t	280	275	245	240	217	185	184	156	138	125	W	0	4	55	N	51	35	1
20	N16	Harcombe Road	N16 0RX	3	1	1	976	t	530			495	405		380	340	247	220	W	0	4	48	N	51	33	31
21	N17	Thackeray Avenue	N17 9DX	3	1	1	1028	t	245		270	220				141	136		W	0	3	35	N	51	35	41
22	N18	Orpington Gardens	N18 1LW	3	1	1	943	t	240		274			240		166.5	160		W	0	4	41	N	51	37	15
23	N19	Giesbach Road	N19 3DA	3	2	1	1320	t	580				346				285	295	W	0	7	59	N	51	33	57
24	N20	Church Crescent	N20 0JR	3	2	1	1234	s	530				580					235	W	0	9	49	N	51	37	31
25	N21	The Alders	N21 1AR	3	2	2	1172	s	425	485	450		383	395			305	265	W	0	6	4	N	51	38	20
26	N22	Berners Road	N22 5NE	3	2	2	997	t	356	333		330			276				W	0	6	33	N	51	35	53
27	E1	Fairclough Street	E1 1PP	3	2	1	1255	t	575			467.5		400				250	W	0	3	58	N	51	30	48
28	E2	Derbyshire Street	E2 6HQ	3	2	2	932	t	478		425			345		323			W	0	3	48	N	51	31	34
29	E3	Hewlett Road	E3 5NA	3	2	2	1177	t	450			475	350	315		300	240	220	W	0	2	9	N	51	31	57
30	E4	Edward Avenue	E4 9DN	3	1	2	942	s	243		220		200			158	135		W	0	0	49	N	51	36	33
31	E5	Daubeney Road	E5 0EF	3	2	2	1075	t	375		325	300		247	235	250		175	W	0	2	13	N	51	33	2
32	E6	Southchurch Road	E6 6DZ	3	1	2	888	t	187	209		180	230	215	185	170	135		E	0	3	28	N	51	31	45
33	E7	Trumpington Road	E7 9EJ	3	1	2	826	t	250		278		212	200	177	160			E	0	0	47	N	51	33	17
34	E8	Kenmure Road	E8 1JU	3	2	2	1288	t	495	515			315	300	295		241.5	222	W	0	3	23	N	51	32	56
35	E9	St. Agnes Close	E9 7HS	3	2	1	873	t	400		520			340			202		W	0	3	8	N	51	32	12
36	E10	Francis Road	E10 6NJ	3	1	1	1113	t	270								162		W	0	0	27	N	51	33	53
37	E11	Wallwood Road	E11 1AL	3	2	1	1057	t	300								175		E	0	0	20	N	51	34	18
38	E12	Sixth Avenue	E12 5PT	3	2	2	1007	t	240	233	249		235	200	178	140		93	E	0	3	29	N	51	32	58
39	E13	Greengate Street	E13 0AS	3	1	2	820	t	225		155				118			83	E	0	1	35	N	51	31	41
40	E14	Portree Street	E14 0HT	3	1	1	1070	t	300	340	295		250	242		200		122	E	0	0	4	N	51	30	51
41	E15	Meeson Road	E15 4AW	3	2	2	1050	t	285				265			220			E	0	0	42	N	51	32	17
42	E16	Clifford Road	E16 4JW	3	2	1	1050	s	245	227	250	230	228			155		110	E	0	0	40	N	51	31	15
43	E17	Aveling Park Road	E17 4NS	3	1	2	1169	t	250	231	272.5	230			198		146	135	W	0	1	5	N	51	35	44
44	E18	Maybank Road	E18 1EJ	3	2	2	1240	t	355		325	250			228				E	0	2	1	N	51	35	46
45	SE1	Cottesloe Mews	SE1 7RU	3	2	1	1098	t	700					400					W	0	6	36	N	51	29	55
46	SE2	Sandycroft	SE2 0XY	3	1	2	812	t	200	215	211	208	192		179		125		E	0	6	11	N	51	28	50
47	SE3	Siebert Road	SE3 7EJ	3	2	1	1189	t	315	245	250	275		249	197	195	145		E	0	1	15	N	51	28	49
48	SE4	Braxfield Road	SE4 2AN	3	2	2	1299	t	340		434				225		170		W	0	2	9	N	51	27	35

49	SE5	Sansom Street	SE5 7RE	3	2	2	1332	t	400	390	330	287	291	278		248			W	0	5	19	N	51	28	33
50	SE6	Torridon Road	SE6 1RF	3	1	1	928	t	249	235	243	220	212	204	185	160	141	110	W	0	0	5	N	51	26	19
51	SE7	Floyd Road	SE7 8AR	3	2	2	984	t	250			190	191.5	193	185	156	139		E	0	2	4	N	51	29	14
52	SE8	Trundleys Road	SE8 5BD	3	2	1	1147	t	325	287	332	305	235	204	192	235	200	154	W	0	2	38	N	51	29	18
53	SE9	Gerda Road	SE9 3SJ	3	2	1	1114	t	250	290		245		195		160	154	150	E	0	4	20	N	51	26	4
54	SE10	Kemsing Road	SE10 0LL	3	2	1	1145	t	445	438	495	380	360	300	280			215	E	0	1	0	N	51	29	7
55	SE11	Hanover Gardens	SE11 5TN	3	2	2	1458	t	700	788	775	635	525				465		W	0	6	49	N	51	28	56
56	SE12	Hedgley Street	SE12 8PE	3	1	1	911	t	310	314	250	214	248		225	200	177	150	E	0	0	31	N	51	27	20
57	SE13	Leahurst Road	SE13 5LW	3	2	2	1156	t	325	347	300		253	225		160		140	E	0	0	5	N	51	27	14
58	SE14	Camplin Street	SE14 5QY	3	1	2	1169	t	330	300		250	237.5		207				W	0	2	46	N	51	28	43
59	SE15	Elcot Avenue	SE15 1QD	3	1	1	1028	t	345			235			235		156	143	W	0	3	52	N	51	28	42
60	SE16	Ann Moss Way	SE16 2TJ	3	2	1	870	t	375	378		300	250	245			185	187	W	0	3	14	N	51	29	46
61	SE17	Henshaw Street	SE17 1PE	3	2	2	1198	t	525	420	450	350	325	320	297	256	250		W	0	5	24	N	51	29	35
62	SE18	Ankerdine Crescent	SE18 3LG	3	1	1	899	t	220	250	230	199	187.5	218	172			120	E	0	3	56	N	51	28	21
63	SE19	Auckland Road	SE19 2DT	3	1	2	946	t	285			320			250		185		W	0	4	54	N	51	24	34
64	SE20	Chesham Crescent	SE20 7RW	3	1	2	1191	t	275			250	250			187	157	145	W	0	3	15	N	51	24	33
65	SE21	Kennoldes	SE21 8SS	3	2	1	1062	t	275		270	247	193		177		152		W	0	5	30	N	51	26	23
66	SE22	Worlingham Road	SE22 9HD	3	2	2	1065	t	595	582	522		400	367	300		250		W	0	4	23	N	51	27	35
67	SE23	Maclean Road	SE23 1PD	3	1	2	1098	t	330	310	377	292			235			179	W	0	2	30	N	51	27	4
68	SE24	Danecroft Road	SE24 9PA	3	1	2	1192	t	675	650	663	530	420	370	337		307	270	W	0	5	38	N	51	27	25
69	SE25	Bungalow Road	SE25 6JY	3	2	1	1074	t	230	211	239			189	174	135	119	96	W	0	5	3	N	51	23	49
70	SE26	De Frene Road	SE26 4AF	3	1	1	964	t	295	311	297	220	231	223		183	152	146	W	0	2	32	N	51	25	53
71	SE27	Waldeck Grove	SE27 0BE	3	2	1	986	t	330	355	335	285			205	180	162	130	W	0	6	29	N	51	26	2
72	SE28	Fleming Way	SE28 8NR	3	1	2	843	t	160	185				158	155		110	95	E	0	7	40	N	51	30	28
73	SW1	Lyall Mews	SW1X 8DJ	3	2	1	933	t	725			685		543			450		W	0	9	16	N	51	29	48
74	SW2	Margate Road	SW2 5DU	3	1	2	1023	t	400	374	455	373	310	295				187	W	0	7	37	N	51	27	26
75	SW3	Godfrey Street	SW3 3SX	3	2	2	1313	t	1750	1550	1670		1135	1095		852		910	W	0	10	0	N	51	29	23
76	SW4	Kings Avenue	SW4 8DX	3	2	2	1253	t	525	395		465				337.5		245	W	0	7	44	N	51	27	24
77	SW5	Childs Walk	SW5 9RZ	3	2	1	1485	t	1195			930				510		435	W	0	11	39	N	51	29	36
78	SW6	Branksea Street	SW6 6TT	3	2	2	1308	t	800			595	498			500			W	0	12	54	N	51	28	43
79	SW7	Ennismore Gardens	SW7 1HY	3	2	1	1155	t	1650	1690	1350		1050			775		575	W	0	10	17	N	51	29	57
80	SW8	Robertson Street	SW8 3TZ	3	2	1	1010	t	550	420	520	425	380	385	385		310	285	W	0	8	47	N	51	28	8
81	SW9	Trinity Gardens	SW9 8DR	3	1	2	974	t	520		490	435				335	300	280	W	0	7	8	N	51	27	43
82	SW10	Coleherne Mews	SW10 9EA	3	2	1	1118	t	995		1295	790			722		665		W	0	11	28	N	51	29	16
83	SW11	Canford Road	SW11 6NZ	3	2	2	1268	t	685						455	425		387	W	0	9	31	N	51	27	33
84	SW12	Haverhill Road	SW12 0HA	3	2	1	1158	t	600		665	524			405	382	330		W	0	8	28	N	51	26	38
85	SW13	Archway Street	SW13 0AW	3	2	1	1130	t	675	535	650				393.5		360	292	W	0	15	5	N	51	28	12
86	SW14	Sheen Lane	SW14 8LF	3	1	2	1115	t	645		650		475		440	405			W	0	16	5	N	51	27	45
87	SW15	Warwick Drive	SW15 6LB	3	2	2	1373	t	500			440	370			386	300		W	0	14	6	N	51	27	54
88	SW16	Colmer Road	SW16 5LA	3	1	1	1218	t	295	290	283	250	190	180		182		130	W	0	7	32	N	51	24	50
89	SW17	Moffat Road	SW17 7EZ	3	1	2	848	t	345		410	283	249	247	207.5		184.7		W	0	10	1	N	51	25	51
90	SW18	Bridgford Street	SW18 3TQ	3	1	2	1116	t	445		625	468	480			395		260	W	0	11	4	N	51	26	13
91	SW19	Circle Gardens	SW19 3JX	3	1	2	1209	t	425			460		322.5			286		W	0	11	54	N	51	24	21
92	SW20	Southdown Road	SW20 8PX	3	1	2	1184	t	360		465	330	310	355		285			W	0	13	7	N	51	24	48
93	W1	Wyndham Mews	W1H 2PN	3	2	1	1205	t	1550			1150		850					W	0	9	39	N	51	31	9
94	W2	St Petersburgh Mews	W2 4JT	3	2	2	1580	t	1195			560		487	540	360	405		W	0	11	25	N	51	30	42
95	W3	Wilfrid Gardens	W3 0NQ	3	1	2	1252	t	360	375	375	354			272				W	0	16	7	N	51	31	24
96	W4	Priory Road	W4 5JA	3	2	1	1054	t	530	473	625	512	390	432			310		W	0	15	47	N	51	29	55
97	W5	Devonshire Road	W5 4TP	3	1	2	973	t	400	490	540	426		357		305	250	250	W	0	18	48	N	51	30	4
98	W6	Silverton Road	W6 9NY	3	2	2	1044	t	525				455		300		308	330	W	0	13	14	N	51	29	0
99	W7	Framfield Road	W7 1NQ	3	1	1	1145	t	330		316		250		250		172	165	W	0	19	59	N	51	31	6
100	W8	Kensington High Street	W8 6NP	3	2	1	1560	t	1450		1025					635			W	0	12	13	N	51	29	50
101	W9	Elgin Mews North	W9 1NN	3	2	1	910	t	675		720		512		477			325	W	0	11	9	N	51	31	49
102	W10	Alperton Street	W10 4NG	3	2	2	1236	t	465		435					250			W	0	12	23	N	51	31	36
103	W11	Sirdar Road	W11 4EG	3	1	1	1226	t	675					550		500			W	0	12	54	N	51	30	43
104	W12	Cobbold Road	W12 9LW	3	1	1	1033	t	477	450	650	482	417	387	300		280	230	W	0	14	43	N	51	30	13
105	W13	Leyborne Avenue	W13 9RA	3	2	2	1180	t	430	485	500	438			375				W	0	18	51	N	51	30	16
106	W14	Ceylon Road	W14 0PY	3	2	1	1421	t	825		935	717.5		568		565	520		W	0	12	54	N	51	29	54
107	NW1	Arlington Road	NW1 7HP	3	2	1	1394	t	800		949		540				425		W	0	8	35	N	51	32	15
108	NW2	Randall Avenue	NW2 7TA	3	1	1	1034	s	390				260		250	234	197.5	180	W	0	14	54	N	51	33	53
109	NW3	Perrins Lane	NW3 1QY	3	2	1	1050	t	1000	875	900	740		630		630		475	W	0	10	39	N	51	33	19
110	NW4	Bell Lane	NW4 2AE	3	2	1	1125	t	440		430						236.5		W	0	13	1	N	51	35	12
111	NW5	Twisden Road	NW5 1DN	3	1	1	1218	t	832	776	766.5			520			430		W	0	8	39	N	51	33	26
112	NW6	Ravenshaw Street	NW6 1NP	3	2	1	1078	t	750			650					355		W	0	12	0	N	51	33	0
113	NW7	Ellesmere Avenue	NW7 3HB	3	2	1	1019	s	385		309		300	274	275	210	200	160	W	0	15	34	N	51	37	29

114	NW8	Ordnance Hill	NW8 6PR	3	2	2	1277	t	1395		1650			1475	1045		950	770	W	0	10	14	N	51	32	6
115	NW9	Silkfield Road	NW9 6QU	3	2	2	1284	s	315	307			278			190		168	W	0	14	50	N	51	35	11
116	NW10	Outgate Road	NW10 9UG	3	2	2	1212	t	380				250	247				160	W	0	14	52	N	51	32	42
117	NW11	Ridge Hill	NW11 8PR	3	2	1	1146	s	650			550			460	439.5		296	W	0	12	27	N	51	34	16
118	EN1	Seaford Road	EN1 1NT	3	1	2	965	t	245	278		241		224	211		205		W	0	4	24	N	51	39	2
119	EN2	Birkbeck Road	EN2 0DX	3	1	1	970	t	325	325		295	260	250	210	205	187		W	0	4	53	N	51	39	54
120	EN3	Oakhurst Road	EN3 6QQ	3	2	1	910	s	215	213	201.5		187				122		W	0	2	14	N	51	40	36
121	EN4	Ridgeway Avenue	EN4 8TN	3	1	1	1106	t	345				250	285	249	212	195	179	W	0	9	26	N	51	38	28
122	EN5	Fairfield Way	EN5 2BQ	3	2	2	1096	t	295				249				190		W	0	11	25	N	51	38	46
123	EN6	Mimms Hall Road	EN6 3DX	3	1	2	1108	s	300		250	285		235				155	W	0	12	29	N	51	41	50
124	EN7	Willow Close	EN7 6RY	3	1	1	849	s	250	312	289.5		248				180		W	0	4	11	N	51	43	15
125	EN8	Northfield Road	EN8 7RG	3	2	1	1045	t	220	228	212		216			160	130		W	0	1	55	N	51	41	34
126	EN9	Crooked Mile	EN9 2ES	3	1	1	847	s	250			199					160		E	0	0		N	51	41	47
127	EN10	Briarley Close	EN10 6QQ	3	1	2	1065	s	370		340	304	290			225		155	W	0	1	26	N	51	44	16
128	EN11	Dorchester Avenue	EN11 9EJ	3	2	1	1040	t	220	221		205				137		120	W	0	0		N	51	46	12
129	IG1	Balfour Road	IG1 4HP	3	1	1	1196	t	250	180				145					E	0	4	16	N	51	33	40
130	IG2	Roll Gardens	IG2 6TW	3	2	2	1126	t	285		249	245		237.5	205		133	124	E	0	3	58	N	51	34	44
131	IG3	Herbert Road	IG3 8AL	3	2	2	1427	t	275			221		160		120		110	E	0	5	38	N	51	33	44
132	IG4	Park View Gardens	IG4 5NP	3	2	2	1174	t	270		267.5	250			242.5	212			E	0	3	22	N	51	35	4
133	IG5	Dellwood Gardens	IG5 0EH	3	1	2	917	t	290		269	250	250	230	215	183		110	E	0	4	1	N	51	35	14
134	IG6	Aintree Crescent	IG6 2HD	3	1	2	850	t	250		273	240			216	177	155	141	E	0	4	54	N	51	35	36
135	IG7	Sunnymede	IG7 6ES	3	2	1	969	s	260			340	245				195		E	0	7	16	N	51	37	14
136	IG8	Canfield Road	IG8 8JH	3	2	1	1088	t	280	248		280		232	245	200	205		E	0	3	4	N	51	36	5
137	IG9	Chestnut Avenue	IG9 6EW	3	1	1	927	s	335	317	285				230		178	180	E	0	2	54	N	51	37	15
138	IG10	Cherston Road	IG10 3PJ	3	2	1	862	t	250	242			210			180			E	0	4	20	N	51	38	49
139	IG11	Cranborne Road	IG11 7XE	3	1	2	999	t	215	193	222	188		182	177	140		98	E	0	5	9	N	51	32	8
140	RM1	Hamilton Avenue	RM1 4RP	3	1	2	1144	s	230				191			160			E	0	10	28	N	51	35	23
141	RM2	Upper Brentwood	RM2 6HX	3	1	1	1058	s	250			291	250		235			150	E	0	12	42	N	51	35	17
142	RM3	Byron Way	RM3 7PR	3	1	2	902	t	145					177			105		E	0	12	37	N	51	35	43
143	RM4	Pancroft	RM4 1BX	3	2	2	1046	s	250		203	250	230					137	E	0	7	21	N	51	39	2
144	RM5	Kingshill Avenue	RM5 2SB	3	1	2	1189	s	200	200	207	185		180		138	111		E	0	10	10	N	51	36	25
145	RM6	Heath Terrace	RM6 6JR	3	1	2	937	t	225		191					128	115.5	115	E	0	7	57	N	51	34	8
146	RM7	Crow Lane	RM7 0HH	3	1	2	938	t	200	218	228	197	185			149	113	106	E	0	8	55	N	51	34	8
147	RM8	Charlecote Road	RM8 3LD	3	1	1	925	t	190	198		166	166	140		119		85	E	0	8	11	N	51	33	15
148	RM9	Canonsleigh Road	RM9 4DJ	3	1	1	988	t	175		210	180	140	131	131		82.5	70	E	0	7	5	N	51	32	7
149	RM10	Hunters Hall Road	RM10 8LH	3	1	1	899	t	180	210	168	164	152	162	134			77	E	0	9	14	N	51	32	57
150	RM11	Bush Elms Road	RM11 1LT	3	1	1	1018	t	250		287	285		244	218	177	146	135	E	0	11	59	N	51	34	7
151	RM12	Milton Avenue	RM12 4BW	3	1	2	960	t	212		240		230	193	178	160	126	115	E	0	11	26	N	51	33	36
152	RM13	Brights Avenue	RM13 9NW	3	1	2	1257	t	200	202	198	165	166			115	115.5	87.5	E	0	12	9	N	51	31	6
153	RM14	Aldborough Road	RM14 2RJ	3	1	2	978	s	295	274	235		217	226		178	150		E	0	14	11	N	51	33	29
154	RM15	Callan Grove	RM15 5PW	3	1	1	978	t	180	198	190	176		157.5		99	91	76	E	0	17	24	N	51	30	12
155	RM16	St Augustine Road	RM16 4NU	3	1	1	913	s	165	140	167.5		160	120				75	E	0	22	27	N	51	29	0
156	RM17	Rectory Road	RM17 6AA	3	1	1	881	t	172	185	183	171	156			102	83	69	E	0	20	28	N	51	28	52
157	RM18	Coleridge Road	RM18 8EE	3	1	1	866	t	127			135	125					59	E	0	22	32	N	51	27	44
158	RM19	Water Lane	RM19 1GU	3	1	2	864	t	160		168	164	156	138	132	110	93.5		E	0	14	11	N	51	29	18
159	RM20	Palmerston Gardens	RM20 4YJ	3	1	2	967	t	160			175			140	110		76.5	E	0	18	3	N	51	28	46
160	DA1	Swaisland Road	DA1 3DE	3	1	1	886	t	180	191	183			165		133	118	94.5	E	0	11	48	N	51	26	55
161	DA2	Clayton Croft Road	DA2 7AU	3	1	2	1082	s	215	265				208			156		E	0	11	16	N	51	25	54
162	DA3	Bowes Wood	DA3 8QL	3	2	2	1049	s	250	250	260					180	157	146	E	0	18	38	N	51	21	40
163	DA4	Dartford Road	DA4 9HX	3	2	2	1263	S	280		285						170		E	0	14	10	N	51	23	46
164	DA5	Glenhurst Avenue	DA5 3QQ	3	1	2	965	S	270					266		205	195		E	0	8	14	N	51	26	16
165	DA6	Faygate Crescent	DA6 7NS	3	2	2	1075	s	250			220			213		135		E	0	8	51	N	51	27	6
166	DA7	Birchington Close	DA7 5ED	3	1	1	984	s	240	220	245	215						144	E	0	9	11	N	51	28	15
167	DA8	Alexandra Road	DA8 2AX	3	1	2	1224	t	170	197	205	175	164		138		86.5		E	0	10	59	N	51	28	38
168	DA9	Ingress Gardens	DA9 9HW	3	1	2	983	t	155	169	174.5	170.5		155		122		80	E	0	17	43	N	51	26	58
169	DA10	Milton Road	DA10 0LS	3	1	1	1199	t	160		159			109	100	117	91	90	E	0	18	16	N	51	26	46
170	DA11	Woodfield Avenue	DA11 7QQ	3	1	2	992	t	170		192.5		173.5	166	148	118	113	95	E	0	21	59	N	51	25	54
171	DA12	Milton Road	DA12 2PF	3	2	2	1309	t	161		250	240	208	135	179		110	87	E	0	22	38	N	51	26	24
172	DA13	Lyndhurst Way	DA13 9EN	3	1	2	1024	s	238.5	250	245	196		212	171.5	156	134	120	E	0	20	58	N	51	24	10
173	DA14	Langdon Shaw	DA14 6AX	3	1	2	941	s	240		275			240			198		E	0	5	40	N	51	25	19
174	DA15	Old Farm Avenue	DA15 8AL	3	1	1	967	t	225	245	227	222	195			165	131	119	E	0	5	26	N	51	26	13
175	DA16	Lodge Hill	DA16 1BL	3	1	2	949	s	215		250				214	187	155	102.5	E	0	7	2	N	51	28	39
176	DA17	Nelson Road	DA17 5ET	3	2	1	1078	s	180	235			179.5			129			E	0	8	31	N	51	29	6
177	BR1	Liddon Road	BR1 2SR	3	2	1	1188	t	230		263		220	203	207	160	130	137.5	E	0	2	2	N	51	24	2
178	BR2	Glanville Road	BR2 9LN	3	1	2	980	t	295			293.5	236		239	189		148	E	0	1	34	N	51	23	55

179	BR3	Broomfield Road	BR3 3QD	3	1	2	1062	t	278	312	337		260	274	242.5	220	195	170	E	0	2	19	N	51	24	0
180	BR4	Langley Way	BR4 0DR	3	1	2	1200	t	305			337	245		240		197.5	167	W	0	0		N	51	22	49
181	BR5	Austin Road	BR5 2BT	3	1	2	1120	s	200			222.5		215	184	163			E	0	6	11	N	51	23	15
182	BR6	Lodge Crescent	BR6 0QE	3	2	2	954	s	280		270	255	214	216	205	195	152	173	E	0	6	21	N	51	22	35
183	BR7	Woodside Avenue	BR7 6BS	3	2	1	956	s	300			276	237			210	180		E	0	4	26	N	51	25	21
184	BR8	Leechcroft Avenue	BR8 8AP	3	1	1	922	s	185		227	228		177	150	133	110	99	E	0	10	57	N	51	23	49
185	CR0	Rymer Road	CR0 6EE	3	1	2	906	t	196	248	225	210			189	144	129	120	W	0	4	58	N	51	23	4
186	CR2	Hyde Road	CR2 9NS	3	2	1	934	s	260	304	290	272	247.5	248	250	220	168.5		W	0	5	28	N	51	19	52
187	CR3	Beechwood Road	CR3 6NF	3	1	2	1149	s	260	250	235	257.5	227	209	190	165	130	130	W	0	4	29	N	51	17	22
188	CR4	Mortimer Road	CR4 3HS	3	1	2	1062	t	220		220	232				176		128	W	0	10	2	N	51	24	36
189	CR5	St Andrews Road	CR5 3HA	3	1	2	988	s	270	332	330	323	250	248	247	221		177	W	0	8	49	N	51	19	15
190	CR6	Hillbury Road	CR6 9TD	3	2	2	1225	s	308	292	287.5	266.5		250	240	191		178	W	0	4	16	N	51	18	35
191	CR7	Buller Road	CR7 8QW	3	1	2	941	t	260		275	246		210	176	181			W	0	5	33	N	51	24	10
192	CR8	Valley Road	CR8 5BU	3	1	2	921	s	275			255			210	196.5			W	0	5	25	N	51	19	7
193	SM1	Prince Of Wales Road	SM1 3PE	3	1	1	861	s	240		250			193.5		182	170		W	0	10	47	N	51	22	31
194	SM2	Belmont Road	SM2 6DW	3	1	1	1043	t	255		278		250	227			153		W	0	12	0	N	51	20	41
195	SM3	Kingston Avenue	SM3 9UF	3	1	2	1106	t	250	295	285	255	236	230	210	185	167.5	158	W	0	12	52	N	51	22	21
196	SM4	Tudor Drive	SM4 4PH	3	1	2	885	s	240			240		203			160		W	0	13	22	N	51	23	26
197	SM5	Bramblewood Close	SM5 1PH	3	1	1	1034	t	205	240	197				167	162	138		W	0	10	6	N	51	22	54
198	SM6	Godalming Avenue	SM6 8NH	3	1	2	920	t	245					230	195				W	0	7	21	N	51	21	51
199	SM7	Chipstead Way	SM7 3JP	3	1	2	1111	s	280	300	307	230	245	242		197	170		W	0	10	13	N	51	19	21
200	KT1	Kenley Road	KT1 3RR	3	1	2	1062	s	325		410				265			225	W	0	16	34	N	51	24	33
201	KT2	Tudor Drive	KT2 5NW	3	2	2	1102	s	450		425	437	375		347.5		280		W	0	18	14	N	51	25	48
202	KT3	Claremont Avenue	KT3 6QR	3	1	2	894	s	300	355	350		250	246		216		155	W	0	14	24	N	51	23	42
203	KT4	Elmstead Gardens	KT4 7BG	3	2	2	928	t	285	250	308	280	251	257	249			165	W	0	14	50	N	51	22	20
204	KT5	Raeburn Avenue	KT5 9EA	3	1	2	1011	s	330			283				226			W	0	16	53	N	51	23	24
205	KT6	Ladywood Road	KT6 7PD	3	1	2	985	t	335		273	245					158		W	0	17	13	N	51	22	37
206	KT7	Greenwood Close	KT7 0BG	3	1	2	956	s	360				315	270		250	207.5	186	W	0	19	48	N	51	22	57
207	KT8	Hurst Road	KT8 1QT	3	1	2	899	t	300	285			196	177	0				W	0	22	36	N	51	24	21
208	KT9	Sussex Gardens	KT9 2PU	3	1	2	912	t	240	250	266.5	266		247	201	171	143	134	W	0	18	40	N	51	21	41
209	KT10	Coverts Road	KT10 0LH	3	1	1	936	t	320			339		350	317	268.5	252		W	0	20	20	N	51	21	8
210	KT11	Haleswood	KT11 2NF	3	1	1	955	t	360	367		322	250				215		W	0	24	27	N	51	19	55
211	KT12	Braycourt Avenue	KT12 2AZ	3	1	2	878	t	285	331	265	235			211	176	173	170.5	W	0	24	20	N	51	23	15
212	KT13	Grotto Road	KT13 8PN	3	1	2	956	s	330			295		249	250	232	170		W	0	27	5	N	51	22	37
213	KT14	Caillard Road	KT14 7JB	3	2	2	863	s	250			214		177	169	147.5	118		W	0	28	42	N	51	20	35
214	KT15	King Georges Drive	KT15 3RN	3	2	2	853	s	250		320	275						145	W	0	30	12	N	51	21	3
215	KT16	Fairway	KT16 8EB	3	1	2	1191	t	250	250	205	226	207.5	197	165	145		143	W	0	29	53	N	51	23	15
216	KT17	Portway	KT17 1SU	3	1	2	1081	s	355	373				270	295	210			W	0	14	49	N	51	20	56
217	KT18	Emily Davison Drive	KT18 5QH	3	2	1	1018	t	310				278	272	235	248		185	W	0	14	28	N	51	18	29
218	KT19	Horton Hill	KT19 8SY	3	1	2	848	s	240		247			194				125	W	0	16	32	N	51	20	30
219	KT20	Preston Lane	KT20 5HJ	3	1	2	860	t	235	230			179				130.5		W	0	13	55	N	51	18	0
220	KT21	Taylor Road	KT21 2HY	3	1	2	1044	s	290	250	277.5	262	250			223	190	150	W	0	18	48	N	51	18	51
221	KT22	Sunmead Close	KT22 9AP	3	1	3	1133	s	305			245	257	262	227.5		172.5	180	W	0	20	17	N	51	17	33
222	KT23	Beales Road	KT23 4NA	3	2	3	1151	s	315	307			235			215		162	W	0	22	18	N	51	16	26
223	KT24	Manor Gardens	KT24 5PF	3	2	2	1199	s	350		323.5			250				205	W	0	23	46	N	51	16	4
224	TW1	Newry Road	TW1 1PL	3	1	1	857	t	360	497		480	460	416	367	337.5	265	305	W	0	19	28	N	51	27	41
225	TW2	Devon Avenue	TW2 6PW	3	1	2	830	t	300	290	333	285	256	275		210	213	174	W	0	21	17	N	51	26	50
226	TW3	Park Road	TW3 2HG	3	1	2	884	t	275		310	260	257		227	201	208		W	0	21	31	N	51	27	37
227	TW4	Hinton Avenue	TW4 6AR	3	1	2	907	s	280	300	325		241	244	245	170	150		W	0	23	29	N	51	27	56
228	TW5	Browning Way	TW5 9BG	3	1	1	935	s	265	282	327	267	280		250		187	169	W	0	23	32	N	51	28	44
229	TW7	The Drive	TW7 4AE	3	1	2	997	s	300		303		272	293		232	183		W	0	20	52	N	51	28	29
230	TW8	Lionel Road North	TW8 9QT	3	2	1	915	t	325		310	301		262.5	238			176.5	W	0	17	50	N	51	29	41
231	TW9	Manor Grove	TW9 4QQ	3	1	2	815	t	400		360	287	320		275		225	200	W	0	17	12	N	51	27	56
232	TW10	Kingfisher Drive	TW10 7UF	3	1	2	842	s	335	423	350		270		250	247	210		W	0	19	5	N	51	26	3
233	TW11	Connaught Road	TW11 0QF	3	2	1	935	t	400				419		340				W	0	21	4	N	51	25	46
234	TW12	Coombe Crescent	TW12 3PD	3	2	2	955	t	325					270		230		185	W	0	22	59	N	51	25	20
235	TW13	Rochester Avenue	TW13 4EJ	3	1	2	1043	t	210		236	197	187		172		128	129	W	0	25	18	N	51	26	35
236	TW14	Sparrow Farm Drive	TW14 0DP	3	1	1	881	t	220		220	190	194	190	158	143	123		W	0	23	33	N	51	27	7
237	TW15	Ashgrove Road	TW15 1NY	3	1	2	1000	s	250		265	247					185		W	0	26	13	N	51	25	46
238	TW16	Heathcroft Avenue	TW16 7SP	3	1	2	943	t	240		238				192	155	140		W	0	25	14	N	51	25	13
239	TW17	Gaston Way	TW17 8EY	3	2	2	997	s	280		300	235		248.5	235	210			W	0	26	22	N	51	23	51
240	TW18	Strodes Crescent	TW18 1DG	3	2	2	1066	s	265	296	268	229	216	232		188		158	W	0	29	16	N	51	25	47
241	TW19	Everest Road	TW19 7ED	3	1	2	1170	s	238	250	250	220	230			169	150	131	W	0	28	31	N	51	27	18
242	TW20	Cherrywood Avenue	TW20 0TF	3	1	2	997	t	260			236				164	155		W	0	34	59	N	51	25	30
243	UB1	Tudor Road	UB1 1NY	3	2	2	1029	t	235		220	220	203	200			136	118	W	0	23	6	N	51	30	48

244	UB2	Kingston Road	UB2 4AW	3	1	2	1232	t	260	219		249		212			137		W	0	22	40	N	51	30	14
245	UB3	Hyde Way	UB3 4PB	3	1	1	834	s	250		269	226		221	219	154.5		127	W	0	25	14	N	51	29	55
246	UB4	Blacklands Drive	UB4 8EX	3	1	2	886	s	220		300	248	217	248		183	164	137	W	0	26	15	N	51	31	40
247	UB5	Clauson Avenue	UB5 4PR	3	2	2	874	t	250	245	282	240	247.5			195	157	146	W	0	21	17	N	51	33	20
248	UB6	Rosedene Avenue	UB6 9SB	3	1	2	988	t	275		285		244			198	191		W	0	22	5	N	51	31	59
249	UB7	Edgar Road	UB7 8HN	3	1	2	1133	s	240			235	250	225	198		152	140	W	0	28	5	N	51	30	46
250	UB8	New Road	UB8 3DX	3	1	2	935	s	275	245	240	250		232	189	175	152.5	148	W	0	26	33	N	51	31	36
251	UB9	Denham Green Close	UB9 5NA	3	2	1	1015	s	330		300						180	170	W	0	29	50	N	51	34	49
252	UB10	Star Road	UB10 0QH	3	1	2	1030	s	255		276	247		202	222		145		W	0	26	39	N	51	31	48
253	HA0	Chaplin Road	HA0 4UT	3	1	2	969	s	265		370		249	269	232	180	150	167	W	0	18	37	N	51	33	0
254	HA1	Gloucester Road	HA1 4PP	3	1	1	1203	s	330		355	343		335	265				W	0	21	33	N	51	35	9
255	HA2	Malvern Avenue	HA2 9EX	3	1	1	947	t	265		280	250	232		204	193	155	160	W	0	22	14	N	51	33	58
256	HA3	Oakfield Avenue	HA3 8TJ	3	1	2	1077	s	288.5		340			280	255			183	W	0	18	51	N	51	35	38
257	HA4	Long Drive	HA4 0HL	3	1	2	882	s	280	229	307	232		249		224	162.5	146	W	0	23	29	N	51	33	34
258	HA5	Melrose Road	HA5 5RA	3	1	2	974	t	325		345	325		260	250	248	200	166	W	0	22	15	N	51	35	23
259	HA6	Winchester Road	HA6 1JG	3	1	2	952	s	360			258	270		277	228	202		W	0	24	47	N	51	35	50
260	HA7	Taunton Way	HA7 1DG	3	1	2	898	s	290		283	243		242		182	165	149	W	0	17	36	N	51	35	54
261	HA8	Vancouver Road	HA8 5DA	3	1	3	1211	s	280			260	265			218		144	W	0	16	18	N	51	36	10
262	HA9	Grasmere Avenue	HA9 8TQ	3	1	2	1079	t	286.5				238				157	150	W	0	17	58	N	51	34	22
263	WD3	Links Way	WD3 3RQ	3	2	2	1032	s	290	345	272			282	295		178	180	W	0	26	0	N	51	39	13
264	WD4	The Orchard	WD4 8JR	3	1	2	943	s	325						223	262			W	0	26	55	N	51	42	42
265	WD5	The Crescent	WD5 0DS	3	1	2	924	s	283		308	282	250	262	203	164	140		W	0	24	51	N	51	42	22
266	WD6	Gateshead Road	WD6 5LL	3	1	2	918	s	270		290	225	275		243.5	170		142	W	0	16	25	N	51	40	6
267	WD7	Trafford Close	WD7 9HU	3	1	2	919	t	310		298	250	222	207	213	218	165	145	W	0	17	24	N	51	41	49
268	WD17	Lebanon Close	WD17 4JW	3	1	2	954	s	325	250	275	260		235		190	137	138	W	0	25	34	N	51	40	49
269	WD18	Cassiobridge Road	WD18 7QL	3	2	2	1035	t	200	243	232	193	180	191	164	149	127	112	W	0	25	20	N	51	39	9
270	WD19	Altham Gardens	WD19 6HJ	3	1	1	851	s	250		225		235	232	182				W	0	23	24	N	51	37	19
271	WD23	Highland Drive	WD23 4LH	3	1	1	993	s	280	295		250		260				174	W	0	21	13	N	51	38	23
272	WD24	Maytree Crescent	WD24 5NJ	3	1	2	1091	s	270		287	218	209	218	180	145	134	137	W	0	24	49	N	51	41	0
273	WD25	Kingswood Road	WD25 0EF	3	1	2	948	s	250	200	274	211	232	240	220	170	160	145	W	0	23	58	N	51	41	20
274	AL1	Cambridge Road	AL1 5LG	3	1	2	937	s	295		295	300		295		232	182		W	0	18	20	N	51	44	54
275	AL2	Peters Avenue	AL2 1NH	3	1	2	871	t	220	225	218			202	185			132	W	0	18	13	N	51	43	34
276	AL3	Ladies Grove	AL3 5TN	3	1	2	1006	s	300	262					250		190		W	0	20	50	N	51	45	45
277	AL4	Beverley Gardens	AL4 9BJ	3	1	1	834	t	250		260	287	270	223			142		W	0	17	42	N	51	46	10
278	AL7	Dalewood	AL7 2JP	3	1	2	891	t	180		233	215	195	178	165		117	135	W	0	9	56	N	51	47	44
279	AL9	Old Hertford Road	AL9 5EY	3	1	2	987	t	240	250		241	220			185	153		W	0	12	46	N	51	46	3
280	AL10	Manor Road	AL10 9LN	3	1	2	863	s	225		210				190		127	124	W	0	14	7	N	51	46	17
281	CM1	Begonia Close	CM1 6NL	3	1	2	847	t	185	202	190	145	128	158	151	114	98	88	E	0	30	13	N	51	45	6
282	CM4	The Meads	CM4 0AD	3	1	2	987	t	250					227	205			143	E	0	22	51	N	51	40	15
283	CM5	Longfields	CM5 9DF	3	1	1	1179	s	300	333		275		285	290		214	200	E	0	14	49	N	51	41	50
284	CM11	Passingham Avenue	CM11 2TA	3	1	1	831	s	225		230			202	220		154	107	E	0	25	44	N	51	36	34
285	CM12	Knightbridge Walk	CM12 0HP	3	1	1	920	s	265		238		225	196	210	143			E	0	24	47	N	51	38	6
286	CM13	Long Ridings Avenue	CM13 1EE	3	1	1	903	s	265	237	238	210		240	202	154	151		E	0	20	31	N	51	38	14
287	CM14	Crescent Road	CM14 5JR	3	1	2	1118	s	284		294				210		165		E	0	17	51	N	51	36	45
288	CM15	St Kildas Road	CM15 9EX	3	2	1	1164	s	257		277	269		226		165	163	141	E	0	17	47	N	51	37	47
289	CM16	Lindsey Street	CM16 6RE	3	1	1	871	t	275	267	261	235	247	177	187	181	137	137	E	0	6	41	N	51	42	27
290	CM17	Elmbridge	CM17 0JX	3	1	2	1013	s	265		295	250	220	297	208	165	150	143	E	0	9	13	N	51	46	59
291	CM18	Stile Croft	CM18 6LW	3	1	2	969	t	148		147	154		150		122	80	76	E	0	7	5	N	51	45	30
292	CM19	Silvesters	CM19 5NN	3	1	2	1071	s	190		230		203	185	166	142			E	0	4	1	N	51	45	30
293	CM20	Ram Gorse	CM20 1PZ	3	1	1	937	s	260				250		215		157	150	E	0	4	55	N	51	46	32
294	TN13	St Johns Hill	TN13 3PB	3	1	2	984	s	235	232	245	192		190	177	145	124	100	E	0	11	45	N	51	17	8
295	TN14	Old London Road	TN14 7AE	3	2	1	1216	s	300			295		250	250	250	120		E	0	8	42	N	51	20	14
296	TN15	Oxenhill Road	TN15 6RQ	3	1	2	827	t	200	185	223		177		165	140	115		E	0	12	45	N	51	18	22
297	TN16	Jail Lane	TN16 3SB	3	2	2	888	s	240		250	205		232	185	188	128	120	E	0	2	18	N	51	18	59
298	SL0	Swallow Street	SL0 0HQ	3	1	1	1071	s	305		282.5			248.5	276	236		143	W	0	31	22	N	51	32	0
299	SL1	Chiltern Road	SL1 7NH	3	2	2	1022	s	280	310		282.5		244		230	168	172.5	W	0	39	47	N	51	31	29
300	SL2	Knolton Way	SL2 5RY	3	2	2	1033	t	218	180	230	210	207	184	185			107	W	0	34	13	N	51	31	18
301	SL3	Verney Road	SL3 8NY	3	1	2	1003	s	245		241			170		153			W	0	32	40	N	51	30	3
302	SL4	Wood Close	SL4 3JZ	3	2	2	1109	t	275	320			225	262		175	150	165	W	0	36	43	N	51	28	9
303	SL5	Francis Chichester	SL5 9AG	3	1	2	1029	t	250		233		204				138	137	W	0	39	58	N	51	24	11
304	HP1	Shrubhill Road	HP1 2BG	3	1	1	949	t	215	165		175		195		140	103		W	0	29	46	N	51	45	3
305	HP2	Kimpton Close	HP2 7PN	3	1	2	900	t	175	189	182			175		137	115		W	0	26	18	N	51	46	32
306	HP3	Deaconsfield Road	HP3 9HZ	3	1	1	964	s	215		287	251				145	165		W	0	27	52	N	51	44	33
307	HP5	Frances Street	HP5 3ES	3	1	1	946	t	210	257		237			209	140	142	132	W	0	36	15	N	51	42	53
308	HP6	Bridge Place	HP6 6JF	3	1	1	852	t	225			237				180			W	0	35	27	N	51	40	26

309	HP7	White Lion Road	HP7 9HZ	3	1	2	854	t	240				225			165			W	0	35	19	N	51	40	19
310	HP9	Farmers Way	HP9 2YY	3	1	1	900	t	290							235	201	185	W	0	36	28	N	51	36	59
311	GU20	Poplar Avenue	GU20 6PW	3	2	2	1054	s	350	337	336	265				247	226	230	W	0	40	18	N	51	22	24
312	GU21	Westmead	GU21 3BS	3	1	1	846	t	230			190	193				139	114	W	0	34	59	N	51	19	3
313	GU22	Oriental Road	GU22 7AH	3	1	2	876	s	280			270	271		229			175	W	0	33	19	N	51	19	6
314	GU24	Heath Drive	GU24 0HQ	3	1	2	1035	t	250	250		241			193	177			W	0	38	0	N	51	18	21
315	GU25	Stroude Road	GU25 4DB	3	1	2	941	s	350		375	289	270	265		220	200	200	W	0	33	20	N	51	24	41

ǂ floor area of house is calculated as the sum of floor areas of bedroom, reception room and kitchen divided by 0.75, as the floor area of bathroom, stairs and hall is estimated as 25% of the total floor area of a house.

* terraced house (t) semi-detached house (s)

Table 28 Sample flat data of London

		Street	Post code	Bed-room	Bath-room	Recep-tion	Floor areaǂ	Price (10 US $/m²)										Longitude				Latitude			
								2009	2008	2007	2006	2005	2004	2003	2002	2001	2000		°	'	''		°	'	''
1	EC1	Goswell Road	EC1V 7DX	2	1	1	742	490		427	320			260				W	0	5	56	N	51	31	32
2	EC2	Barbican	EC2Y 8BP	2	1	1	858	535	500	598	432	377		316	316	250	198	W	0	5	44	N	51	31	6
3	EC3	Pepys Street	EC3N 2NU	2	2	1	875	500		685					330			W	0	4	39	N	51	30	39
4	EC4	High Timber Street	EC4V 3PS	2	2	1	951	600						320			210	W	0	5	46	N	51	30	39
5	WC1	Naoroji Street	WC1X 0GD	2	2	1	642	495	560	486	440		427					W	0	6	38	N	51	31	42
6	WC2	Tavistock Street	WC2E 7PS	2	1	1	535	495				465			350			W	0	7	14	N	51	30	44
7	N1	Baltic Place	N1 5AQ	2	2	1	699	365	350	335	350	305	243	230	203	173	162	W	0	4	39	N	51	32	12
8	N2	East End Road	N2 0RX	2	2	1	600	275	275	305		244					120	W	0	10	41	N	51	35	29
9	N3	Etchingham Park Road	N3 2DS	2	2	1	660	245		360				250	228		173	W	0	10	59	N	51	36	24
10	N4	Tollington Park	N4 3QT	2	1	1	561	265		265	243	184	195	195	194	131	127	W	0	7	0	N	51	33	55
11	N5	Drayton Park	N5 1NF	2	2	1	731	365	385	332	260	232	230	275	246	175	151	W	0	6	13	N	51	33	19
12	N6	Shepherds Hill	N6 5RE	2	2	1	741	310		355			295					W	0	8	12	N	51	34	43
13	N7	Bunning Way	N7 9UP	2	1	1	742	250	217	245	230	220	205		130	122	100	W	0	7	13	N	51	32	33
14	N8	Tottenham Lane	N8 7HF	2	2	1	737	285	250	285	270	210	250	230				W	0	2	34	N	51	35	0
15	N9	Mottingham Road	N9 8DY	2	1	1	684	162	159				152	125	107			W	0	2	33	N	51	38	13
16	N10	Colney Hatch Lane	N10 1EB	2	2	1	597	255	230	217			187	182	179	126	113	W	0	8	46	N	51	35	52
17	N11	Sparkford Gardens	N11 3GS	2	2	1	761	300		285	275	238			215	180		W	0	9	2	N	51	36	50
18	N12	The Lindens	N12 9DL	2	1	1	647	225		222		170	174	180	170	135	110	W	0	10	12	N	51	36	55
19	N13	Davey Close	N13 4EX	2	1	1	635	245		215	187.5	170		135				W	0	6	47	N	51	36	55
20	N14	Leigh Hunt Drive	N14 6DJ	2	1	1	545	260	213	190	183	173	185	157	133	133	114	W	0	7	34	N	51	37	44
21	N15	St. Anns Road	N15 3TR	2	1	1	676	173		170	160	148	125	132	104	105	75	W	0	5	36	N	51	34	52
22	N16	Manor Road	N16 5SH	2	1	1	593	215	175						103		90	W	0	4	28	N	51	33	55
23	N17	Lordship Lane	N17 6RR	2	2	1	538	140		150	139		125	123	85	75	59.5	W	0	4	27	N	51	35	54
24	N18	Moree Way	N18 2UL	2	1	1	625	140		150	144.5			123.5	99			W	0	3	57	N	51	36	59
25	N19	Goddard Place	N19 5GT	2	2	1	614	270	325	335	250	250	287		235	171	181	W	0	8	10	N	51	33	35
26	N20	High Road	N20 0PZ	2	1	1	612	230	237	250	205		225			141	120	W	0	10	38	N	51	37	30
27	N21	Eversley Park Road	N21 1NB	2	2	1	866	250	277	245	235			208	190	163	150	W	0	6	39	N	51	38	34
28	N22	Palmerston Road	N22 8RJ	2	1	1	653	230			185.5		165		125			W	0	6	51	N	51	36	43
29	E1	Newark Street	E1 2ET	2	1	1	614	250		214		208		180	160	150		W	0	3	19	N	51	31	2
30	E2	Victoria Park Square	E2 9PQ	2	1	1	676	325		280	220	196				174	140	W	0	3	15	N	51	31	45
31	E3	Wellington Road	E3 4XG	2	1	1	582	210			167	159	152	145		134		W	0	1	28	N	51	31	27
32	E4	Westward Road	E4 8QJ	2	1	1	562	165	167	155		150	142.5			84		W	0	1	29	N	51	36	38
33	E5	Warwick Grove	E5 9LW	2	2	1	665	187		182	149.5	132						W	0	3	22	N	51	33	54
34	E6	Albatross Close	E6 5NX	2	2	1	583	170	203	185				152				E	0	3	32	N	51	31	8
35	E7	Wellington Road	E7 9BP	2	1	1	602	188	250	200								E	0	1	2	N	51	33	5
36	E8	Holly Street	E8 3XT	2	1	1	616	250		250				210	191.5		132	W	0	4	19	N	51	32	27
37	E9	Eastway	E9 5JP	2	1	1	594	170					120		105			W	0	1	47	N	51	32	48
38	E10	Skeltons Lane	E10 5DB	2	1	1	460	155	124			110		76			58	W	0	0	48	N	51	34	10
39	E11	South Birkbeck Road	E11 4HY	2	1	1	520	190			162		144	136		90	82	E	0	0	6	N	51	33	23

		Street	Post code	Bed-room	Bath-room	Recep-tion	Floor area‡	Price (10 US $/m²)										Longitude				Latitude			
								2009	2008	2007	2006	2005	2004	2003	2002	2001	2000		°	′	″		°	′	″
40	E12	Queensberry Place	E12 6UN	2	2	1	590	215	187	188.5	172	165	166	166	140	130		E	0	2	47	N	51	32	52
41	E13	Orwell Road	E13 9DH	2	1	1	511	202		210			144					E	0	2	0	N	51	31	58
42	E14	Limehouse Causeway	E14 8AG	2	2	1	645	240						160				W	0	1	45	N	51	30	34
43	E15	Chopwell Close	E15 4RP	2	1	1	561	220	200	250	214	195	181.5	160	140		100	E	0	0	13	N	51	32	22
44	E16	Connaught Road	E16 2AE	2	1	1	549	220		215	165	155		153	145			E	0	2	37	N	51	30	11
45	E17	Hawthorne Road	E17 4QB	2	2	1	597	175					165					W	0	1	9	N	51	35	24
46	E18	Victoria Road	E18 1LF	2	1	1	543	218	210		168	165	150	140			98	E	0	1	59	N	51	35	25
47	SE1	Weston Street	SE1 3QZ	2	2	1	700	375	355		320	340	260		220	190	170	E	0	5	8	N	51	30	5
48	SE2	Chantry Close	SE2 9PP	2	1	1	530	165					176					W	0	7	15	N	51	29	29
49	SE3	Westcombe Park Road	SE3 7QX	2	1	1	667	270		270	190			177.5				W	0	0	45	N	51	28	42
50	SE4	Adelaide Avenue	SE4 1YR	2	1	1	655	225	243	217.5	187		173		140		117	W	0	1	43	N	51	27	32
51	SE5	Albany Road	SE5 0DS	2	2	1	542	230	227	215			180	165	155	130	116	E	0	4	38	N	51	29	15
52	SE6	Britton Close	SE6 1AP	2	1	1	648	170		162	154	155	144			117		W	0	0	29	N	51	26	43
53	SE7	Floyd Road	SE7 8AY	2	1	1	544	165		200		170			119		76	E	0	2	0	N	51	29	12
54	SE8	Glaisher Street	SE8 3ES	2	1	1	529	270		247	210	179	202	168.5	167.5	172	140	W	0	1	8	N	51	28	55
55	SE9	Pullman Place	SE9 6EG	2	1	1	597	165	166	167	142		140		110		92	E	0	2	54	N	51	27	17
56	SE10	Blackheath Road	SE10 8DA	2	1	1	828	235	194	220				170			107	W	0	1	5	N	51	28	23
57	SE11	Wincott Street	SE11 4NY	2	1	1	588	290	280		262	235		207	233	202	145	W	0	6	31	N	51	29	29
58	SE12	Burnt Ash Hill	SE12 0AN	2	1	1	705	170		165	154	149	156			93	88	E	0	1	9	N	51	26	32
59	SE13	Belmont Grove	SE13 5DU	2	1	1	682	200	220	218	205		170			136	131	W	0	0	12	N	51	27	48
60	SE14	Sterling Gardens	SE14 6DU	2	1	1	674	200	185	174	158	125		125		94		W	0	2	30	N	51	28	49
61	SE15	Kelly Avenue	SE15 5LH	2	1	1	616	209	212	226.5	190			170				W	0	4	31	N	51	28	28
62	SE16	Brunel Road	SE16 7HU	2	2	1	828	300	327		250	225			170			W	0	3	1	N	51	30	5
63	SE17	St Pauls Terrace	SE17 3QH	2	1	1	524	240	256			217	164		160	160	121	W	0	6	9	N	51	29	6
64	SE18	Plumstead High Street	SE18 1JH	2	1	1	638	130		135	130		107			78		E	0	5	37	N	51	29	13
65	SE19	Crystal Palace Park	SE19 2LB	2	1	1	586	210				183	180	160	141			W	0	4	42	N	51	25	6
66	SE20	Howard Road	SE20 8HH	2	1	1	779	180		175		162	130	120	119			W	0	3	24	N	51	24	44
67	SE21	Glazebrook Close	SE21 8RP	2	1	1	749	220	199	248				174		121		W	0	5	26	N	51	26	21
68	SE22	East Dulwich Road	SE22 9AN	2	1	1	523	265		232			175				110	W	0	4	23	N	51	27	39
69	SE23	Perry Vale	SE23 2LG	2	1	1	530	200		209		147	149	133		80	72	W	0	3	7	N	51	26	12
70	SE24	Half Moon Lane	SE24 9HS	2	1	1	621	275	212	187	225	192	168				115	W	0	5	45	N	51	27	9
71	SE25	Tennison Road	SE25 5RP	2	1	1	615	160	169	165				133	132	105		W	0	4	54	N	51	23	46
72	SE26	Cricketers Walk	SE26 6DR	2	1	1	606	200		160			163	152.5		118	89	W	0	3	23	N	51	25	31
73	SE27	Norwood Road	SE27 9DD	2	1	1	737	200	245	210		182						W	0	6	18	N	51	26	15
74	SE28	Greenhaven Drive	SE28 8FY	2	1	1	578	154	167	157	145		127					E	0	6	44	N	51	30	34
75	SW1	Cambridge Street	SW1V 4EQ	2	1	1	730	375	465	475	365	326		296		248		W	0	8	29	N	51	29	19
76	SW2	Belvedere Place	SW2 5TD	2	2	1	677	232.5	280	260		222	192			158		W	0	7	15	N	51	27	38
77	SW4	St Alphonsus Road	SW4 7AW	2	1	1	589	285	283	292			226.5	197			152	W	0	8	15	N	51	27	38
78	SW5	Collingham Place	SW5 0QE	2	2	1	732	479	500	472		352	340		343	305		W	0	11	21	N	51	29	40
79	SW6	St Olafs Road	SW6 7DL	2	1	1	688	345	360	333	303	265	260	230		210	172	W	0	12	32	N	51	28	47
80	SW7	Cromwell Road	SW7 4XB	2	2	1	1001	750	785	685			465	390		300		W	0	11	16	N	51	29	44
81	SW8	Vauxhall Grove	SW8 1TB	2	1	1	607	310		327	265	247			220	202	180	W	0	7	17	N	51	29	6
82	SW9	Turner Close	SW9 6UQ	2	1	1	602	265	215	245		186			158	145	138	W	0	6	7	N	51	28	36
83	SW10	Coleherne Road	SW10 9BS	2	1	1	688	450		467	365		300	275			250	W	0	11	26	N	51	29	19
84	SW11	Rochelle Close	SW11 2RY	2	1	1	682	340		310				260				W	0	10	49	N	51	27	42
85	SW12	Nightingale Lane	SW12 8NS	2	1	1	666	320	329	315			230	217.5			165	W	0	9	28	N	51	27	2
86	SW13	Hillersdon Avenue	SW13 0EG	2	1	1	738	365	362		300		305				182	W	0	14	38	N	51	28	21
87	SW14	St Leonards Road	SW14 7NG	2	1	1	716	275	257	290	230	220	218	190	196	195	182.5	W	0	16	11	N	51	28	2
88	SW15	Putney Hill	SW15 6BJ	2	1	1	744	295	282	305			220	226		202		W	0	13	8	N	51	27	22
89	SW16	Averil Grove	SW16 3ET	2	1	1	709	200	173	202.5		171.5			105	87	83	W	0	6	33	N	51	25	8
90	SW17	Longley Road	SW17 9LE	2	1	1	768	225	215				180	168			129	W	0	9	49	N	51	25	13
91	SW18	Frogmore	SW18 1HL	2	1	1	544	280	305	295	266	235	234	220	200	188	176	W	0	11	49	N	51	27	30
92	SW19	Kipling Drive	SW19 1TN	2	1	1	509	240	190	250	201	192.5		178		136	117	W	0	10	48	N	51	25	25
93	SW20	Rothesay Avenue	SW20 8JU	2	1	1	676	250	226	220	190	166		176	153		126	W	0	12	51	N	51	24	38
94	W1	Wells Street	W1T 3PN	2	2	1	794	695	750			427	415				310	W	0	8	23	N	51	31	7
95	W2	Orsett Terrace	W2 6JT	2	1	1	543	395		325		244		195	225	161.5		W	0	11	1	N	51	31	5
96	W3	Manor Court	W3 8JX	2	1	1	623	250		270	227	205		207		185	145	W	0	16	53	N	51	29	41
97	W4	Chaseley Drive	W4 4BD	2	2	1	613	300	236	295		265	202					W	0	16	37	N	51	29	28
98	W5	Ealing Village	W5 2LY	2	1	1	628	250	280	275.5	272	245		235		190	163	W	0	17	49	N	51	30	57
99	W6	Cromwell Avenue	W6 9LB	2	1	1	638	335		320	300	230	215	205			165	W	0	14	8	N	51	29	31
100	W7	Church Road	W7 3BX	2	1	1	723	250			234		212.5		185		139	W	0	20	40	N	51	30	52
101	W8	Pembroke Road	W8 6DL	2	1	1	636	595	542					285	256			W	0	11	49	N	51	29	42

		Street	Post code	Bed-room	Bath-room	Recep-tion	Floor area	Price (10 US $/m²)										Longitude					Latitude		
								2009	2008	2007	2006	2005	2004	2003	2002	2001	2000		°	`	``		°	`	``
102	W9	Maida Vale	W9 1RJ	2	1	1	508	300	212	240	213	235		187		177		W	0	11	1	N	51	31	50
103	W10	St Ervans Road	W10 5QY	2	1	1	806	310				250		216	178	149		W	0	12	24	N	51	31	21
104	W11	Lorne Gardens	W11 4XX	2	2	1	700	450		363	350	285	235	280	250	220	220	W	0	12	55	N	51	30	14
105	W12	Coningham Road	W12 8BY	2	1	1	655	310		320			195					W	0	14	5	N	51	30	18
106	W13	Woburn	W13 8DS	2	1	1	623.5	260			212			158			96	W	0	19	7	N	51	31	28
107	W14	Kensington High Street	W14 8NY	2	1	1	576	445	415	525	442					235	220	W	0	12	7	N	51	29	54
108	NW1	Regents Park Road	NW1 8AT	2	2	1	624	460	457	415	500		350					W	0	9	13	N	51	32	36
109	NW2	Campbell Gordon Way	NW2 6RW	2	1	1	521	245		245			180		148	134		W	0	13	53	N	51	33	30
110	NW3	Adelaide Road	NW3 5EB	2	2	1	673	380			280		280			225	175	W	0	10	28	N	51	32	32
111	NW4	Great North Way	NW4 1PN	2	1	1	616	245	242			210	220	208.5	200		143	W	0	13	14	N	51	35	52
112	NW5	Dartmouth Park Hill	NW5 1HR	2	1	1	568	360		313	272		207.5		203		160	W	0	8	25	N	51	33	33
113	NW6	Cavendish Road	NW6 7XW	2	1	1	518	300		310	246	247	226		180	170	150	W	0	12	17	N	51	32	40
114	NW7	Grenville Place	NW7 3SF	2	1	1	609	250	205	235	225		220	195	165	155	130	W	0	15	30	N	51	36	55
115	NW8	Grove End Road	NW8 9HL	2	1	1	657	424.5		400			299				173	W	0	10	30	N	51	31	41
116	NW9	Elmwood Crescent	NW9 9AB	2	1	1	643	210	216	185	185	151	140	142		92	88.5	W	0	15	51	N	51	35	18
117	NW10	Butler Road	NW10 9RT	2	1	1	641	170	215				155	127				W	0	14	56	N	51	32	41
118	NW11	Finchley Road	NW11 6XX	2	1	1	632	285		282	246	249	240	210	165			W	0	11	57	N	51	35	9
119	EN1	Park Avenue	EN1 2HR	2	1	1	490	180	186	189	160	157		160	126	114	83.5	W	0	4	46	N	51	38	37
120	EN2	Perry Mead	EN2 8BZ	2	1	1	569	200			170			155		114		W	0	5	38	N	51	39	39
121	EN3	Roedean Avenue	EN3 5QN	2	1	1	507	145	135	142.5	133.5	142.5	131		100	84		W	0	2	45	N	51	39	53
122	EN4	St Wilfrids Road	EN4 9SB	2	1	1	548	210	214	200		152	147.5		128		116	W	0	9	57	N	51	38	50
123	EN5	Leicester Road	EN5 5DY	2	1	1	537	200		210			182	170		125		W	0	11	5	N	51	38	54
124	EN6	Wayside	EN6 5NE	2	1	1	657	170		161	150		125		91	93		W	0	10	5	N	51	41	35
125	EN7	Valley View	EN7 5HL	2	1	1	718	180	171	154	160	157		125		108		W	0	5	10	N	51	42	38
126	EN8	Turners Hill	EN8 8SA	2	1	1	619	165		143	138	132	131	120		95	75	W	0	2	1	N	51	42	1
127	EN9	Peregrin Road	EN9 3PF	2	1	1	503	160	170	167		151	145		110			E	0	1	32	N	51	41	5
128	EN10	Mulberry Close	EN10 6HN	2	1	1	564	146		160		125		119		83		W	0	1	17	N	51	43	40
129	EN11	Village Close	EN11 0GQ	2	1	1	526	155	160			140	143	133	122.5	94	70	E	0	0	27	N	51	46	5
130	IG1	Hyacinth Close	IG1 2FT	2	1	1	634	150	168		145	150	125	118	105	71	72	E	0	4	15	N	51	32	38
131	IG2	St Peters Close	IG2 7QL	2	1	1	626	150	175	157	140			112	115	81		E	0	5	55	N	51	34	57
132	IG3	Express Drive	IG3 9RD	2	1	1	551	175	146	155		125	130			70		E	0	7	1	N	51	33	57
133	IG4	Margaret Way	IG4 5DE	2	1	1	633	190	208	220	172		152	130		97.5	95	E	0	3	3	N	51	34	36
134	IG5	Heathcote Avenue	IG5 0QR	2	1	1	659	170		187	170	145	147	140	120		92	E	0	3	38	N	51	35	41
135	IG6	Hatfield Close	IG6 2JJ	2	1	1	659	160	160	170		153	152.5		125			E	0	4	33	N	51	35	26
136	IG7	Keats Close	IG7 5NU	2	1	1	594	160		175	155	144		142		80	73	E	0	5	4	N	51	36	25
137	IG8	The Bridle Path	IG8 9LD	2	1	1	641	190				160		148			85	E	0	0	37	N	51	36	17
138	IG9	Cedar Close	IG9 6EJ	2	1	1	567	200	225	215	177	173	172	171	150	110	102	E	0	2	55	N	51	37	25
139	IG10	Chigwell Lane	IG10 3UA	2	1	1	511	165	195	173	171	155	163	153	116	96	92	E	0	4	56	N	51	38	45
140	IG11	Wanderer Drive	IG11 0XN	2	1	1	533	140	127		136				100			E	0	7	3	N	51	31	33
141	RM1	Monkwood Close	RM1 2NQ	2	1	1	570	170	166	162	169	162	150	149	129	107	98	E	0	11	36	N	51	34	38
142	RM2	Royle Close	RM2 5PS	2	1	1	613	175	165	142		155	142	127	122	87		E	0	12	3	N	51	34	31
143	RM3	Holdbrook Way	RM3 0JD	2	1	1	605	139	151	156		123	139		103	82.5	67	E	0	13	54	N	51	35	30
144	RM4	Ongar Road	RM4 1BN	2	2	1	737	255		319				249		195		E	0	7	7	N	51	39	6
145	RM5	Chelmsford Avenue	RM5 3XH	2	1	1	769	150			140	130				78		E	0	10	40	N	51	36	5
146	RM6	Padnall Road	RM6 5ER	2	1	1	669	135	120	132	123		108	92				E	0	8	9	N	51	34	55
147	RM7	Dagenham Road	RM7 0TH	2	1	1	604	150	150	137	132		122	117		81	63	E	0	10	31	N	51	33	47
148	RM8	Emerald Gardens	RM8 1LG	2	1	1	552	125		155			134				66	E	0	8	57	N	51	33	43
149	RM9	Wagstaff Gardens	RM9 4HQ	2	1	1	531	135	143	163	137.5	132	136	115	85	80	76	E	0	7	14	N	51	32	15
150	RM10	Honey Close	RM10 8TF	2	1	1	570	130	107	126	116	109	101	90	70	53	57	E	0	9	38	N	51	32	30
151	RM11	Ardleigh Green Road	RM11 2SR	2	1	1	666	165	157	160	133		133			79		E	0	13	16	N	51	35	7
152	RM12	Wood Lane	RM12 5NH	2	1	1	553	160		162	142	132		115	86	82.5		E	0	12	5	N	51	32	35
153	RM13	Malan Square	RM13 7JA	2	1	1	655	125		135	126	119	120	97	77	63		E	0	11	54	N	51	32	36
154	RM14	Macon Way	RM14 1NZ	2	1	1	616	152	157	144	124			99		67		E	0	16	20	N	51	34	14
155	RM15	Gidea Close	RM15 6PF	2	1	1	499	106	125	125	116	116	104	89	61	54	47	E	0	17	43	N	51	31	23
156	RM16	Grenville Road	RM16 6BG	2	1	1	556	155	149	152	135	137	135	120	117	99	83	E	0	17	17	N	51	28	59
157	RM17	Vicarage Square	RM17 6JJ	2	1	1	501	125	124	130	115	110	107	95	82	54	48	E	0	19	15	N	51	28	30
158	RM18	Queen Mary Avenue	RM18 8NR	2	1	1	554	90	93	110		101	84	78	51	45	35	E	0	25	15	N	51	28	54
159	RM19	Harrisons Wharf	RM19 1QW	2	1	1	716	146	158	152	149		150	132	121	90	87	E	0	13	57	N	51	28	54
160	RM20	Oakley Close	RM20 4AN	2	1	1	575	115	123	105	103	105	93	77	56	49	42	E	0	17	30	N	51	28	33
161	DA1	Churchill Close	DA1 1QL	2	1	1	499	110		116	115	107	107	89	70	65	53	E	0	14	16	N	51	26	12
162	DA2	Osbourne Road	DA2 6RL	2	1	1	537	123	127	120	102	104	104	94	75	55	48	E	0	14	15	N	51	26	48
163	DA3	Meadow Lane	DA3 8PW	2	1	1	623	130	169	156	145	140	138	122	115	95	75	E	0	18	22	N	51	21	57

		Street	Post code	Bed-room	Bath-room	Recep-tion	Floor area	Price (10 US $/m²)										Longitude				Latitude			
								2009	2008	2007	2006	2005	2004	2003	2002	2001	2000		°	′	″		°	′	″
164	DA4	Old Mill Close	DA4 0BN	2	1	1	626	162	185	172	145	164	156	155	140	115	96	E	0	13	4	N	51	22	22
165	DA5	Bexley High Street	DA5 1AH	2	1	1	507	180	190				135	145				E	0	8	57	N	51	26	29
166	DA6	Robin Hood Lane	DA6 8LL	2	1	1	635	168					150				93	E	0	8	7	N	51	27	13
167	DA7	East Street	DA7 4HJ	2	1	1	644	185	180	172	165	165	160	155		105	91	E	0	8	55	N	51	27	28
168	DA8	Frobisher Road	DA8 2PQ	2	1	1	544	110		115		108		91	80	59		E	0	11	16	N	51	28	37
169	DA9	Chalice Way	DA9 9PR	2	1	1	575	130		135	136	133	127	115	95	90	70	E	0	15	56	N	51	26	57
170	DA10	Gilbert Close	DA10 0NH	2	1	1	715	135	100	123	105	108	100				50	E	0	17	47	N	51	26	39
171	DA11	London Road	DA11 9JR	2	1	2	489	141.5	133	125	103	95	98		85			E	0	20	56	N	51	26	31
172	DA12	Fenners Marsh	DA12 2JB	2	1	1	579	125				130						E	0	24	0	N	51	26	9
173	DA13	Lances Close	DA13 0EU	2	1	1	576	120										E	0	21	37	N	51	22	37
174	DA14	Sidcup Hill	DA14 6JS	2	1	1	523	125					128	126			74	E	0	6	55	N	51	25	13
175	DA15	Manor Road	DA15 7JA	2	1	1	705	165	190	177.5	165	156.5	150	140	130	97	88	E	0	6	0	N	51	25	55
176	DA16	Axminster Crescent	DA16 1EZ	2	1	1	529	145				140					68.5	E	0	7	14	N	51	28	18
177	DA17	Hattersfield Close	DA17 5QT	2	1	1	496	125		139					110		71.5	E	0	8	34	N	51	29	19
178	BR1	Blyth Road	BR1 3RS	2	1	1	613	205	190	211			159	160	132		100	E	0	0	34	N	51	24	32
179	BR2	Durham Avenue	BR2 0RF	2	1	1	572	200	180	187	153	152	152	141	120	100	101	E	0	0	33	N	51	23	55
180	BR3	Cadogan Close	BR3 5XY	2	1	1	767	212.5	226			175	145			124	106	E	0	0	19	N	51	24	27
181	BR4	High Street	BR4 0LE	2	1	1	635	215		245	222.5		222.5	197.5				W	0	1	25	N	51	22	38
182	BR5	Craylands	BR5 3HA	2	1	1	631	130	148		137.5	140	146	125	115	91	82	E	0	6	54	N	51	23	51
183	BR6	Hilda Vale Close	BR6 7AH	2	1	1	659	199	195	197		167	163	138		108	111	E	0	3	37	N	51	21	45
184	BR7	Lower Camden	BR7 5JE	2	1	1	694	230			220.5				170			E	0	3	12	N	51	24	33
185	BR8	Edwards Gardens	BR8 8HR	2	1	1	608	140	165				107			60	52	E	0	10	5	N	51	23	33
186	CR0	Hardcastle Close	CR0 6XQ	2	1	1	650	150	175	163.5		151	150	138	96.5	100	87.5	W	0	4	30	N	51	23	19
187	CR2	Heathhurst Road	CR2 0BA	2	1	1	475	165			136	164	149	147	120	107		W	0	5	28	N	51	20	53
188	CR3	Bushes Road	CR3 0BX	2	1	1	559	175	188	160	160	155	147	130	119	105	82	W	0	4	19	N	51	18	2
189	CR4	Mullards Close	CR4 4FF	2	1	1	661	150	165	161	134	138	142	120	100	90	79	W	0	9	46	N	51	22	54
190	CR5	Coulsdon Road	CR5 1EA	2	1	1	563	178				140.5	122.5				81	W	0	7	15	N	51	18	26
191	CR6	Succombs Hill	CR6 9JG	2	1	1	663	160	144	158	164		145				92	W	0	4	7	N	51	18	1
192	CR7	Warwick Road	CR7 7NH	2	1	1	552	150		150	156		148		92.5		72	W	0	6	57	N	51	24	6
193	CR8	High Street	CR8 2AD	2	1	1	594	170	162					134	112		95	W	0	6	47	N	51	20	25
194	SM1	Glena Mount	SM1 4HW	2	1	1	722	165	185	175	160	160		145		98	91	W	0	11	13	N	51	22	8
195	SM2	Cedar Gardens	SM2 5EQ	2	1	1	551	165	190				133	152	128	105	94	W	0	11	18	N	51	21	29
196	SM3	Chelsea Gardens	SM3 9TN	2	1	1	572	170	175	170	171	151	142	128	123	88	72	W	0	12	48	N	51	22	7
197	SM4	London Road	SM4 5HG	2	1	1	499	150	190	177	158	155	130	134		90		W	0	11	53	N	51	23	54
198	SM5	Philips Close	SM5 2FE	2	1	1	695	162	187	158	155							W	0	9	39	N	51	22	49
199	SM6	Foxglove Way	SM6 7JU	2	1	1	543	145	169	169	150	141	141	137	111	89	76	W	0	9	13	N	51	22	51
200	SM7	Dunnymans Road	SM7 2AN	2	1	1	607	200	178	185	175		160			128	102.5	W	0	12	37	N	51	19	27
201	KT1	Kingsworthy Close	KT1 3ER	2	1	1	538	220	192	189	173	168	170	162	152	119	118	W	0	17	36	N	51	24	26
202	KT2	Sopwith Way	KT2 5AG	2	1	1	588	225	248	250	225	227	227	220	189	175		W	0	18	8	N	51	24	48
203	KT3	Wickham Close	KT3 6AN	2	1	1	627	210	190		202	155	164	165	165	127.5		W	0	15	15	N	51	23	37
204	KT4	Percy Gardens	KT4 7SA	2	1	1	760	200	195	205		152	175	172	137	120	105	W	0	15	46	N	51	22	58
205	KT5	Cranes Park Avenue	KT5 8BU	2	1	1	641	225		285	219	205	216	173	163	127	137	W	0	17	56	N	51	23	58
206	KT6	Kingswood Close	KT6 6DZ	2	1	1	688	210		245	250	217		191.5	159			W	0	18	3	N	51	23	22
207	KT7	Portsmouth Road	KT7 0TE	2	1	1	568	230	247	257	219	187	186	175	162	140	136	W	0	19	40	N	51	23	14
208	KT8	Walton Road	KT8 2HT	2	1	1	814	165	177	160	150		142	125		83	65	W	0	21	37	N	51	24	3
209	KT9	North Parade	KT9 1QN	2	1	1	630	175	190	210	165	163.5	173	150		105.5		W	0	17	56	N	51	21	53
210	KT10	Garson Road	KT10 8LN	2	1	1	628	215		225	175	175		203		144		W	0	22	57	N	51	21	49
211	KT11	Lyster Mews	KT11 1LA	2	2	1	640	225	240	220	201.5	195	197		162		159	W	0	24	28	N	51	20	7
212	KT12	Nelson Close	KT12 2ND	2	1	1	719	175	165		140			141	117		85	W	0	24	42	N	51	23	7
213	KT13	Oatlands Drive	KT13 9JH	2	1	1	740	225			250		200		180	169		W	0	25	49	N	51	22	58
214	KT14	Petersham Close	KT14 7HT	2	1	1	647	185	171	187			154	153	136	120	94	W	0	28	32	N	51	20	27
215	KT15	Langton Close	KT15 2EF	2	1	1	578	160	161	175	140	145	145	128	124	102	97	W	0	29	38	N	51	22	39
216	KT16	Tucker Road	KT16 0HD	2	1	1	509	165	147	165	159		145	147	116	87	83	W	0	31	41	N	51	21	54
217	KT17	Chessington Road	KT17 1TQ	2	1	1	595	200	227	218	209	190		186	144		134.5	W	0	15	12	N	51	21	7
218	KT18	Dorking Road	KT18 7NN	2	1	1	672	200				188	180		150	123		W	0	16	39	N	51	19	33
219	KT19	Poplar Crescent	KT19 9ER	2	1	1	737	190		224	197	186		159	134	121	104.5	W	0	16	35	N	51	21	36
220	KT20	Watermead	KT20 5HB	2	1	1	721	155		171		156	152	135	115	103		W	0	14	19	N	51	17	56
221	KT21	Greville Park Road	KT21 2QN	2	1	1	626	200	175	203	200			145	135	127	95	W	0	18	10	N	51	18	33
222	KT22	Epsom Road	KT22 8TA	2	2	1	575	200		197	165	157			140	103	94.5	W	0	19	16	N	51	17	50
223	KT23	Eastwick Park Avenue	KT23 3LR	2	1	1	548	176	172	165	153		147	140		113	105	W	0	22	10	N	51	16	55
224	KT24	Farleys Close	KT24 6NB	2	1	1	576	210		230	179		160		135	111		W	0	27	7	N	51	16	41
225	TW1	Clifden Road	TW1 4LR	2	1	1	738	250		285	247		232.5	215	216	168.5	133	W	0	20	2	N	51	26	54

		Street	Post code	Bed-room	Bath-room	Recep-tion	Floor area‡	Price (10 US $/m²)										Longitude				Latitude			
								2009	2008	2007	2006	2005	2004	2003	2002	2001	2000		°	`	``		°	`	``
226	TW2	Hampton Road	TW2 5QJ	2	1	1	646	217	240	248	179.5	184	171	165	143.5	136	136.5	W	0	20	44	N	51	26	26
227	TW3	Highlands Close	TW3 4HA	2	1	1	621	185	175		160	155	147		116		91	W	0	21	46	N	51	28	35
228	TW4	Conway Road	TW4 5LP	2	1	1	604	185	182	185	150	145	150	142	155	109.5	100	W	0	22	20	N	51	27	20
229	TW5	Channel Close	TW5 0PJ	2	1	1	605	185		205	173	173		152	126			W	0	22	6	N	51	28	45
230	TW7	Twickenham Road	TW7 7DZ	2	1	1	735	200		230	188		170		138.5	148.5		W	0	19	56	N	51	27	42
231	TW8	Field Lane	TW8 8NA	2	1	1	662	150		200	169		172			80.5		W	0	18	55	N	51	28	59
232	TW9	Grena Road	TW9 1XT	2	1	1	753	250	275		257	250	230.5	205	246	150	190	W	0	17	23	N	51	27	48
233	TW10	Sheen Court	TW10 5DE	2	1	1	732	310		343	270	262	249	235	175	185	170	W	0	17	1	N	51	27	54
234	TW11	Waldegrave Road	TW11 8LU	2	1	1	603	225	195		235		170					W	0	20	18	N	51	25	53
235	TW12	Uxbridge Road	TW12 1SN	2	1	1	639	182	180			174	174	165	137	99		W	0	21	48	N	51	25	39
236	TW13	High Street	TW13 4HP	2	1	1	705	152		176	155		135		108		80	W	0	25	12	N	51	26	17
237	TW14	Hounslow Road	TW14 9DD	2	1	1	651	160			164				115			W	0	24	18	N	51	27	2
238	TW15	The Clumps	TW15 1AT	2	1	1	710	180	175		155			142	120	95.5		W	0	26	19	N	51	26	6
239	TW16	Oakhall Drive	TW16 7LE	2	1	1	621	175	169	165	157	148	155	129	118	104	92	W	0	25	28	N	51	25	44
240	TW17	Shepperton Court	TW17 8EJ	2	1	1	696	190	187	165	158	172	147.5	142	133	115	95	W	0	27	11	N	51	23	47
241	TW18	Laleham Road	TW18 2QQ	2	1	1	667	170			170	167	168		144	108	104	W	0	30	26	N	51	25	34
242	TW19	Jordans Close	TW19 7PU	2	1	1	629	160	194	191	149	166	165	152	122		98	W	0	29	2	N	51	27	5
243	TW20	Greenacre Court	TW20 0RF	2	1	1	624	180	213	195	175	172	170	160		128	110	W	0	34	17	N	51	25	36
244	UB1	Longford Avenue	UB1 3QR	2	1	1	594	155			165	135					74	W	0	21	54	N	51	30	42
245	UB2	Norwood Road	UB2 4EA	2	1	1	630	165			160	150			98	85	80	W	0	22	51	N	51	29	57
246	UB3	Croyde Avenue	UB3 4EL	2	1	1	630	160		167	150		137		101	72.5		W	0	25	25	N	51	29	44
247	UB4	Portland Road	UB4 8LH	2	1	1	615	170		161	154			120	102		67.5	W	0	25	41	N	51	31	58
248	UB5	Lilliput Avenue	UB5 5QL	2	1	1	642	180	173		161	133	139.5	102		84		W	0	22	41	N	51	32	31
249	UB6	Buckingham Avenue	UB6 7RB	2	1	1	592	205	232		192	183	169	165	132		86.5	W	0	19	16	N	51	32	26
250	UB7	The Brambles	UB7 7UQ	2	1	1	529	155		183	154		150	133.5	105			W	0	28	25	N	51	29	44
251	UB8	Corwell Gardens	UB8 3JT	2	1	1	677	169		180			171	155				W	0	26	30	N	51	31	10
252	UB9	Green Tiles	UB9 5HX	2	1	1	711	200	215		185	187	175	158		140	127	W	0	30	5	N	51	34	51
253	UB10	Melville Close	UB10 8TY	2	1	1	536	189		177	168	168			149		106	W	0	26	6	N	51	34	1
254	HA0	Alliance Close	HA0 2NG	2	1	1	584	190		190	190		170	165	139	110	98	W	0	18	9	N	51	33	21
255	HA1	London Road	HA1 3LZ	2	1	1	590	240					204	192	169	153		W	0	20	24	N	51	34	1
256	HA2	Stuart Avenue	HA2 9BB	2	1	1	627	170	167		147	146	137.5	145		105	81	W	0	22	33	N	51	33	48
257	HA3	Lime Close	HA3 7JG	2	1	1	643	170	176	178	148		142	130	119	120	84	W	0	19	33	N	51	36	1
258	HA4	Edwards Avenue	HA4 6UT	2	1	1	585	190		221			160	171		125	115	W	0	23	47	N	51	33	15
259	HA5	Lonsdale Close	HA5 4RY	2	1	1	678	215	210	200		166		152.5		132.5	114	W	0	22	42	N	51	36	24
260	HA6	Dormans Close	HA6 2FX	2	1	1	609	210		199			195			130		W	0	25	38	N	51	36	32
261	HA7	Lowther Road	HA7 1ER	2	1	1	522	220		192	183		160		101	90	86	W	0	17	19	N	51	35	41
262	HA8	Gatting Close	HA8 9YU	2	1	1	528	175	199	165		140	163		97	107	88	W	0	15	59	N	51	36	20
263	HA9	Kings Drive	HA9 9JE	2	1	1	751	185		160		133	160		119	84	74	W	0	16	29	N	51	34	3
264	WD3	Solomons Hill	WD3 1EA	2	1	1	781	190	235	221	196	184	165	172.5		124	119	W	0	28	12	N	51	38	23
265	WD4	Saddlers Walk	WD4 8DL	2	1	1	561	160	175	164	154	150	134		107	96	75	W	0	26	59	N	51	42	50
266	WD5	De Havilland Way	WD5 0XF	2	1	1	553	150		160		181		140	110		72.5	W	0	24	59	N	51	41	58
267	WD6	Croft Court	WD6 1LL	2	1	1	559	175		189	172		152	165	137	117	105	W	0	15	15	N	51	39	23
268	WD7	The Dell	WD7 8JG	2	1	1	681	215			212	197		145	174	137		W	0	19	22	N	51	40	56
269	WD17	Grove Mill Lane	WD17 3TU	2	1	1	530	185			194		182	215	117		118	W	0	25	45	N	51	40	32
270	WD18	Crusader Way	WD18 6SD	2	1	1	508	175			156	143	142	135	119	91	94	W	0	24	44	N	51	38	47
271	WD19	Redwood Close	WD19 6SE	2	1	1	575	140	135	152	121	119	120	130	92	100	80	W	0	23	33	N	51	37	22
272	WD23	Meadowcroft	WD23 3BY	2	1	1	622	175	185		125	170		135	105	80	85	W	0	21	32	N	51	38	32
273	WD24	Norbury Avenue	WD24 4PD	2	1	1	580	190		180	181	180	165	168	119		105	W	0	23	24	N	51	39	56
274	WD25	Peregrine Close	WD25 9AQ	2	1	1	573	170	167	159	145	137	145	127	105	87	79	W	0	22	37	N	51	41	25
275	AL1	Lemsford Road	AL1 3PS	2	1	1	639	200		232	203	180	198	185	152	129		W	0	19	30	N	51	45	27
276	AL2	Wyedale	AL2 1TG	2	1	1	541	160	158	149	150	133	133	123	93	90	75	W	0	17	1	N	51	43	9
277	AL3	Blenkin Close	AL3 6EB	2	1	1	712	210	223	185	167				110	123	104	W	0	20	47	N	51	46	10
278	AL4	Cedar Court	AL4 0DL	2	1	1	538	160	165	165	153	129	142	137	125	91	80	W	0	17	51	N	51	45	7
279	AL7	Hilly Fields	AL7 2HD	2	1	1	593	145		143	146	158	117	127	108	83	65	W	0	10	16	N	51	48	13
280	AL9	Alderman Close	AL9 7DS	2	1	1	594	155	144		152				89	72		W	0	13	7	N	51	44	1
281	AL10	Malting Mead	AL10 8AR	2	1	1	608	165	190	180	167	133	155	146	100	72	86	W	0	13	3	N	51	45	49
282	CM1	Clematis Tye	CM1 6GL	2	1	1	558	135	130	140	110	120	123	102	96	74	56	E	0	29	37	N	51	45	16
283	CM4	Station Lane	CM4 0BN	2	1	1	824	249		190	167	159	185	145	145		127	E	0	22	56	N	51	40	0
284	CM5	Cripsey Avenue	CM5 0AT	2	1	1	548	143		128	110		112	100	109	62	50	E	0	14	13	N	51	43	0
285	CM11	Southend Road	CM11 2RA	2	1	1	839	250	208	218	207							E	0	25	46	N	51	36	50
286	CM12	St Ediths Court	CM12 9HZ	2	1	1	620	205			158	175	154	136		96	85	E	0	24	54	N	51	37	25
287	CM13	Canterbury Way	CM13 3BA	2	1	1	565	160	139	159	135	141	107	114	84	75	73	E	0	17	55	N	51	36	5

		Street	Post code	Bed-room	Bath-room	Recep-tion	Floor area‡	Price (10 US $/m²)										Longitude				Latitude			
								2009	2008	2007	2006	2005	2004	2003	2002	2001	2000		°	'	''		°	'	''
288	CM14	Pompadour Close	CM14 5LB	2	1	1	698	160		140	152	136	144	132	114		75	E	0	17	59	N	51	36	25
289	CM15	Doddinghurst Road	CM15 9EW	2	1	1	550	160	148	160	140		128			67	71	E	0	17	59	N	51	37	37
290	CM16	Fir Trees	CM16 6SJ	2	1	1	686	190				172	162	164		108	95	E	0	7	8	N	51	42	17
291	CM17	Victoria Gate	CM17 9TA	2	1	1	543	145	153	147	142	138	126	123	106	83	74	E	0	7	48	N	51	45	57
292	CM18	Willowfield	CM18 6RR	2	1	1	713	105		125	121	120	99	89	73	70	60	E	0	5	34	N	51	45	35
293	CM19	Milwards	CM19 4SW	2	1	1	560	85			97		72	84	65		43	E	0	4	41	N	51	44	59
294	CM20	Dads Wood	CM20 1JL	2	1	1	606	115	135	137	132	120	110	113	92	75	67	E	0	5	35	N	51	46	2
295	TN13	St Johns Road	TN13 3JZ	2	1	1	629	205		200	189		183	177	172	167	155	E	0	11	36	N	51	16	59
296	TN14	Meadway	TN14 7EY	2	1	1	561	160				155	120	130	105		90	E	0	8	0	N	51	19	33
297	TN15	Collet Road	TN15 6SJ	2	1	1	603	190			160							E	0	12	47	N	51	18	29
298	TN16	Lambert Close	TN16 3DQ	2	1	1	617	160		165	157	159	126	128	125	79	81	E	0	1	50	N	51	18	57
299	SL0	St Davids Close	SL0 0RS	2	1	1	690	195		188	184	179	167	172.5	138	118		W	0	31	16	N	51	32	29
300	SL1	Boarlands Close	SL1 5DD	2	1	1	685	145			143	137.5	136.5	125	110	102	88	W	0	37	59	N	51	30	58
301	SL2	Rochfords Gardens	SL2 5XJ	2	1	1	681	130		143.5	135	132	132		87	84	73	W	0	34	9	N	51	30	53
302	SL3	Shelley Close	SL3 8JW	2	1	1	697	145		156	156	151	148	130	118		98	W	0	32	48	N	51	29	40
303	SL4	Byron Court	SL4 4PU	2	1	1	639	225		211	216	180	180	187		161	130	W	0	37	56	N	51	28	15
304	SL5	The Glen	SL5 7DF	2	1	1	674	225			167	185	185		147	139	121	W	0	39	14	N	51	24	23
305	HP1	Long Chaulden	HP1 2NT	2	1	1	646	138		139		115			70	70		W	0	29	58	N	51	45	23
306	HP2	Ashby Court	HP2 7QL	2	1	1	573	118	110	120	116	115	115	102	74	68	61	W	0	26	25	N	51	46	54
307	HP3	Bennetts End Road	HP3 8DZ	2	1	1	666	150	146	134			125	108				W	0	26	54	N	51	44	34
308	HP5	Broad Street	HP5 3DZ	2	1	1	596	158	131	132	106	127			114	88	76	W	0	36	39	N	51	42	32
309	HP6	Cherry Orchard	HP6 6LE	2	1	1	583	197		198	169	170	150	150	118		88	W	0	35	39	N	51	40	46
310	HP7	Quickberry Place	HP7 0BA	2	1	1	616	205			181			146	130	106		W	0	36	22	N	51	40	9
311	HP9	Beaconsfield Mews	HP9 1BF	2	1	1	765	232		215		215	177		166		133	W	0	40	9	N	51	36	0
312	GU20	Fromow Gardens	GU20 6QN	2	1	1	532	170		170	153		155	125	128	0	106	W	0	39	22	N	51	21	48
313	GU21	Sussex Place	GU21 2RD	2	1	1	716	160					150	159	121	120	101	W	0	37	19	N	51	19	2
314	GU22	Calluna Court	GU22 7HU	2	1	1	555	190	163	170		169	165	134	128	108	95	W	0	33	26	N	51	18	58
315	GU24	Bakersgate Gardens	GU24 0NE	2	1	1	564	200		197	193	173	150					W	0	38	8	N	51	16	53
316	GU25	Callow Hill	GU25 4LT	2	1	1	546	250	320		305	265	242		222	211	205	W	0	34	40	N	51	24	37

‡ floor area of flat is calculated as the sum of floor areas of bedroom, reception room and kitchen divided by 0.8, as the floor area of bathroom and hall is estimated as 20% of the total floor area of a flat.

Appendix 5-3 Commuting data in London

Table 29 Commuting flow matrix in Greater London

	00AB	00AC	00AD	00AE	00AF	00AG	00AA	00AH	00AJ	00AK	00AL	00AM	00AN	00AP	00AQ	00AR	00AS	00AT	00AU	00AW	00AX	00AY	00AZ	00BA	00BB	00BC	00BD	00BE	00BF	00BG	00BH	00BJ	00BK
00AB	24,442	197	99	179	70	1,496	3,645	102	187	402	216	976	255	299	54	6,416	95	90	1,380	432	16	444	134	64	4,461	5,939	18	915	41	4,071	1,045	159	3,275
00AC	104	59,511	35	5,467	77	12,077	7,715	153	1,575	4,096	101	1,573	1,433	3,844	2,625	140	1,021	612	5,770	1,843	73	1,133	129	140	389	313	229	1,789	42	2,509	548	532	16,330
00AD	368	132	41,216	143	4,996	2,469	6,577	707	181	116	9,501	702	330	119	31	397	109	169	1,548	601	73	1,808	2,984	191	582	112	89	4,662	169	2,831	216	621	7,690
00AE	43	6,127	31	42,988	63	8,106	4,155	180	6,707	432	119	816	3,706	731	5,110	47	2,130	1,402	2,533	3,924	110	1,112	146	207	274	108	395	1,559	57	1,661	200	665	16,412
00AF	137	162	3,197	198	63,942	3,771	9,859	6,268	286	89	2,591	723	856	136	50	119	247	279	2,090	1,244	230	3,570	5,369	646	426	101	188	6,059	799	3,382	197	1,378	12,790
00AG	39	1,498	33	1,349	56	36,396	8,798	145	648	291	141	1,209	1,871	664	329	42	480	466	4,989	2,272	81	1,343	138	136	288	90	195	1,785	45	2,610	201	578	18,829
00AA	0	15	-	13	3	331	2,060	3	10	3	0	68	56	19	4	10	6	11	338	70	3	45	7	12	10	0	3	104	3	261	17	16	602
00AH	76	212	302	317	5,153	3,252	5,920	78,408	404	118	529	595	1,291	183	93	84	457	573	1,754	1,477	827	6,842	1,559	3,517	202	60	484	4,517	6,741	1,999	138	4,273	10,583
00AJ	34	967	30	5,269	94	4,544	4,865	178	54,258	224	132	522	8,583	260	2,594	43	13,054	9,868	1,797	4,102	364	1,033	166	363	237	81	1,586	1,315	62	1,422	135	943	13,969
00AK	205	5,645	52	1,037	80	5,601	5,218	145	632	54,352	129	2,549	849	10,196	340	232	454	338	5,321	1,079	38	809	127	117	663	541	100	1,257	46	2,144	1,713	315	9,057
00AL	334	177	5,049	251	3,201	3,046	5,616	695	250	195	34,333	857	612	171	40	142	149	238	1,778	929	63	2,291	5,567	251	985	130	111	5,138	137	3,644	248	942	8,851
00AM	221	680	49	515	99	7,134	5,182	123	456	876	251	25,642	1,164	2,334	92	124	209	281	7,745	1,256	60	1,283	237	117	1,073	394	150	2,031	51	5,249	1,099	562	9,981
00AN	22	260	20	814	57	4,005	7,965	203	2,425	84	60	578	26,684	136	170	28	1,088	2,095	1,793	7,075	265	1,158	128	465	126	43	848	1,373	118	1,939	69	1,910	15,301
00AP	147	3,016	39	1,076	66	10,507	5,520	209	671	4,252	153	3,140	1,495	28,648	273	98	338	458	7,947	1,886	73	1,230	174	145	517	274	179	1,859	56	2,349	1,004	517	13,478
00AQ	53	5,006	23	9,471	42	3,674	3,156	114	4,541	322	53	424	1,484	335	37,327	30	6,171	1,135	1,396	1,151	100	497	72	118	100	45	242	856	38	1,011	98	298	7,886
00AR	7,279	194	331	156	159	1,998	8,345	143	166	552	258	1,301	259	338	66	47,262	118	85	1,935	359	29	547	138	96	3,410	4,850	42	1,390	47	5,023	1,169	155	4,691
00AS	30	694	16	2,673	49	1,755	1,662	115	8,186	146	52	204	1,795	114	4,686	24	64,868	5,294	666	935	151	409	83	162	83	37	544	513	58	559	54	244	5,065
00AT	17	261	34	811	61	1,748	2,348	212	5,490	96	113	246	3,589	89	397	24	12,806	43,218	759	1,804	1,007	692	125	309	94	26	7,024	658	101	760	45	763	5,921
00AU	107	1,009	44	539	49	10,187	7,927	155	481	621	139	2,755	1,477	1,873	114	60	259	334	26,656	1,676	45	1,185	153	130	343	126	118	1,879	51	2,839	395	485	12,835
00AW	19	238	22	555	62	3,551	10,098	164	861	55	54	442	3,682	117	103	17	574	788	1,818	25,881	108	1,030	75	219	75	37	310	1,170	62	2,952	61	1,088	15,946
00AX	9	117	38	186	74	1,543	2,872	638	473	41	58	188	1,324	37	72	24	1,059	1,483	714	847	33,431	1,029	68	3,042	71	25	3,787	1,038	1,191	827	21	2,405	5,415
00AY	69	414	142	480	827	8,090	9,690	3,135	671	142	599	1,467	3,375	374	89	55	468	900	4,148	4,366	527	36,385	1,346	1,831	379	114	859	8,271	802	3,418	182	8,027	24,347
00AZ	166	273	1,171	328	6,673	4,963	7,247	2,462	461	143	4,552	1,225	1,114	270	86	93	238	368	2,668	1,790	179	5,687	35,170	583	650	147	260	11,117	398	3,948	233	1,891	13,728
00BA	31	183	53	251	318	2,942	6,048	3,193	550	51	182	445	2,308	134	73	15	527	843	1,420	2,221	3,511	3,392	255	31,261	152	36	1,335	2,290	3,740	1,705	75	8,409	10,154
00BB	2,696	406	144	524	207	3,847	5,011	183	432	586	734	2,390	735	674	60	939	214	284	2,709	1,496	80	1,155	388	142	31,321	2,973	132	2,088	61	9,125	2,155	539	8,558
00BC	4,665	566	142	382	128	3,798	8,204	171	344	1,190	333	2,347	593	909	113	3,003	208	226	3,105	741	47	851	188	106	6,029	37,636	88	1,763	41	6,919	5,442	265	8,121
00BD	10	181	12	342	64	2,505	4,831	322	1,468	49	57	288	3,179	55	161	18	3,381	6,875	1,020	1,748	3,552	1,205	76	835	61	13	33,927	1,214	260	1,202	42	1,990	8,336
00BE	124	329	280	425	927	6,003	9,039	1,208	533	142	1,142	1,401	1,678	274	119	67	324	463	3,204	2,558	267	8,505	3,165	562	586	153	312	36,540	263	4,245	251	2,545	16,503
00BF	34	81	72	129	517	1,444	2,557	7,601	306	39	104	223	852	48	48	25	388	540	681	883	3,117	1,829	266	6,725	95	26	746	1,407	38,226	873	38	3,214	4,696
00BG	383	256	140	186	186	4,081	10,109	180	289	214	276	2,669	938	324	59	309	148	241	3,230	1,250	60	1,092	328	122	1,842	409	159	2,182	58	28,900	560	399	9,306
00BH	848	714	80	495	147	5,555	6,343	261	439	2,662	341	3,962	834	2,469	112	589	210	272	4,302	1,378	49	1,055	224	134	3,252	3,730	107	1,717	41	4,796	34,796	406	10,313
00BJ	34	299	62	417	326	7,141	13,941	1,501	973	111	255	1,047	6,228	230	132	31	850	1,691	3,397	6,214	1,804	5,942	406	4,328	216	65	2,331	4,090	983	4,030	141	40,579	24,409
00BK	20	506	20	1,225	103	6,787	9,516	215	918	121	92	749	2,371	228	140	26	601	572	2,443	4,765	90	1,387	153	186	169	62	249	1,653	61	2,846	119	875	46,254

Appendix 5-4 Pajek data of commuting in London (over 8000 trip)

```
*Vertices 59
1 00AC 0.5240283 0.1923168 0.5
2 00AG 0.5278638 0.1846633 0.5
3 00BK 0.5276871 0.1810442 0.5
4 00AD 0.5487962 0.1754876 0.5
5 00AL 0.5429105 0.1768764 0.5
6 00AE 0.5201774 0.1858286 0.5
7 00AF 0.5428972 0.1656563 0.5
8 00AA 0.5324844 0.1812688 0.5
9 00AH 0.5332901 0.1635416 0.5
10 00AJ 0.5158876 0.1817149 0.5
11 00AN 0.5235697 0.1789502 0.5
12 00AS 0.5078898 0.1836521 0.5
13 00AT 0.5135165 0.1756424 0.5
14 00AK 0.5324253 0.1964215 0.5
15 00AP 0.5311977 0.1896426 0.5
16 00AM 0.5343701 0.1854856 0.5
17 00AQ 0.5149872 0.1900667 0.5
18 00AR 0.5540503 0.1873963 0.5
19 00AU 0.531128 0.1849778 0.5
20 00AW 0.5255364 0.1796234 0.5
21 00AY 0.5308436 0.1743545 0.5
22 00BE 0.5338199 0.1766622 0.5
23 00BJ 0.5261155 0.174047 0.5
24 00AZ 0.5376718 0.1739816 0.5
25 00BA 0.5254728 0.1694224 0.5
26 00BB 0.5413568 0.1830148 0.5
27 00BG 0.5363988 0.1816361 0.5
28 00BC 0.5439148 0.1894646 0.5
29 00BD 0.5173459 0.1728141 0.5
30 00BH 0.5377572 0.1902235 0.5
31 00KC 0.5042049 0.2556399 0.5
32 00KA 0.5084359 0.2229117 0.5
33 00LC 0.5776568 0.1715573 0.5
34 29UH 0.5802495 0.1515864 0.5
35 00MB 0.4484326 0.1725229 0.5
36 00MC 0.4707064 0.1731567 0.5
37 00MF 0.4776927 0.1706349 0.5
38 00MS 0.4423333 0.1135572 0.5
39 24UD 0.4474244 0.1155788 0.5
40 12UG 0.5424259 0.2547642 0.5
41 12UB 0.5458672 0.2578256 0.5
42 22UL 0.5902213 0.1920558 0.5
43 00KF 0.5879539 0.1866838 0.5
44 22UN 0.6142271 0.2236606 0.5
45 22UG 0.5967745 0.2235379 0.5
46 24UE 0.4548356 0.1062431 0.5
47 00MR 0.4656066 0.1027664 0.5
48 24UH 0.4711553 0.1059288 0.5
49 24UJ 0.4260876 0.1067734 0.5
50 33UC 0.6237568 0.3166533 0.5
51 33UG 0.6218557 0.3089626 0.5
52 33UH 0.6223612 0.2957824 0.5
53 38UB 0.4498752 0.2291692 0.5
54 38UC 0.4524903 0.2064827 0.5
55 38UE 0.4387404 0.192971 0.5
56 42UG 0.6333948 0.2573532 0.5
57 42UD 0.6167213 0.2444843 0.5
58 45UG 0.5314604 0.1262769 0.5
59 45UE 0.5273175 0.1378143 0.5

*Arcs
1 2 60.385
1 3 81.65
4 5 47.505
6 2 40.53
6 3 82.06
7 8 49.295
7 3 63.95
2 8 43.99
2 3 94.145
9 3 52.915
10 11 42.915
10 12 65.27
10 13 49.34
10 3 69.845
14 15 50.98
14 3 45.285
5 3 44.255
16 3 49.905
11 3 76.505
15 2 52.535
15 3 67.39
17 6 47.355
18 8 41.725
12 10 40.93
13 12 64.03
19 2 50.935
19 3 64.175
20 8 50.49
20 3 79.73
21 8 48.45
21 2 40.45
21 22 41.355
21 23 40.135
21 3 121.735
24 22 55.585
24 3 68.64
25 23 42.045
25 3 50.77
26 27 45.625
26 3 42.79
28 8 41.02
28 3 40.605
29 3 41.68
22 8 45.195
22 21 42.525
22 3 82.515
27 8 50.545
27 3 46.53
30 3 51.565
23 8 69.705
23 3 122.045
3 8 47.58
31 32 67.035
33 34 41.09
35 36 57.325
37 36 72.885
38 39 58.555
40 41 103.635
42 43 43.1
44 45 43.855
39 38 63.01
46 47 42.01
48 47 63.205
49 38 56.84
50 51 118.01
52 51 72.28
53 54 45.495
55 54 48.135
56 57 53.085
58 59 41.465
```

Appendix 5-5 Regression result of London

Table 30 OLS Regression of house price on distance to centre in London

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	129		129		147		242	
F	50.48		31.73		80.99		180.3	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.284		0.200		0.358		0.429	
Adj R-squared	0.279		0.194		0.354		0.427	
Root MSE	165.0		174.0		211.1		312.1	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-15.1	609.7	-12.9	728.4	-22.3	989.9	-37.8	1,335.4
Std. Err.	2.1	35.8	2.3	39.1	2.5	42.0	2.8	46.6
t	-7.1	17.0	-5.6	18.6	-9.0	23.6	-13.4	28.7
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-19.3	538.8	-17.5	651.0	-27.2	906.9	-43.4	1,243.7
Interval]	-10.9	680.6	-8.4	805.9	-17.4	1,072.8	-32.3	1,427.2

Table 31 OLS Regression of house price on commuting time to centre in London

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	129		129		147		242	
F	51.43		35.48		77.26		181.75	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.288		0.218		0.348		0.431	
Adj R-squared	0.283		0.212		0.343		0.429	
Root MSE	164.6		172.0		212.8		311.5	
	Time	Constant	Time	Constant	Time	Constant	Time	Constant
Coef.	-6.5	736.8	-6.0	867.8	-9.3	1,162.3	-16.3	1,658.6
Std. Err.	0.9	52.2	1.0	59.4	1.1	61.3	1.2	68.8
t	-7.2	14.1	-6.0	14.6	-8.8	19.0	-13.5	24.1
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-8.3	633.5	-8.0	750.3	-11.4	1,041.2	-18.6	1,523.0
Interval]	-4.7	840.2	-4.0	985.4	-7.2	1,283.5	-13.9	1,794.2

Table 32 OLS Regression of flat price on distance to centre in London

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	150		157		159		245	
F	106.43		96.25		126.67		238.95	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.418		0.383		0.447		0.496	
Adj R-squared	0.414		0.379		0.443		0.494	
Root MSE	97.3		108.7		160.0		202.2	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-11.3	556.4	-12.2	753.5	-20.1	988.9	-27.8	1,183.8
Std. Err.	1.1	18.4	1.2	21.1	1.8	31.0	1.8	29.7
t	-10.3	30.2	-9.8	35.8	-11.3	31.9	-15.5	39.9
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-13.5	520.0	-14.6	711.9	-23.7	927.7	-31.4	1,125.3
Interval]	-9.2	592.8	-9.7	795.1	-16.6	1,050.2	-24.3	1,242.3

Table 33 OLS Regression of flat price on commuting time to centre in London

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	150		157		159		245	
F	123.79		117.44		136.4		281.92	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.456		0.431		0.465		0.537	
Adj R-squared	0.452		0.427		0.462		0.535	
Root MSE	94.1		104.4		157.3		193.8	
	Time	Constant	Time	Constant	Time	Constant	Time	Constant
Coef.	-5.2	668.1	-5.9	889.5	-8.7	1,159.9	-12.7	1,452.3
Std. Err.	0.5	26.6	0.5	31.1	0.7	43.7	0.8	42.5
t	-11.1	25.1	-10.8	28.6	-11.7	26.5	-16.8	34.2
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-6.1	615.6	-6.9	828.1	-10.2	1,073.6	-14.1	1,368.7
Interval]	-4.3	720.7	-4.8	950.9	-7.3	1,246.3	-11.2	1,535.9

Appendix 6-1 Sample apartment data of Seoul (summary)

Table 34 Sample 2 bedroom apartment data (summary)

Variable	Unit	Number of obs.	Mean	Std. dev.	Min.	Max.	Percentiles (%)				
							10	25	50	75	90
Floor area	m²	401	59.8	4.3	49.0	81.0	55.0	59.0	60.0	60.0	64.0
Distance1*	km	154	14.5	8.8	0.3	35.0	4.1	7.2	13.1	21.6	26.7
Distance2**	km	122	11.6	7.9	1.9	32.1	3.7	5.2	9.5	15.0	24.7
Distance3***	km	130	12.9	7.4	0.2	26.6	3.5	5.7	13.3	18.5	23.4
Price 1998	10 $/m²	289	179.1	54.7	60.2	375.0	110.8	135.6	175.0	216.7	250.0
Price 2001		397	168.0	62.8	67.8	400.0	102.5	119.5	154.2	200.0	250.0
Price 2004		401	260.2	124.6	68.3	791.7	133.9	177.0	233.3	308.3	422.5
Price 2007		400	320.2	180.6	71.7	1,206.3	142.0	200.0	276.7	384.3	541.7
Rent 1998		289	97.9	30.4	35.9	200.0	58.0	75.8	95.8	120.8	138.9
Rent 2001		397	113.3	41.4	38.9	258.3	63.6	83.1	112.5	139.8	162.5
Rent 2004		401	151.0	57.5	44.2	325.0	81.9	110.2	144.1	187.5	225.0
Rent 2007		400	165.8	67.7	38.1	468.8	87.5	118.6	156.8	208.3	254.6

* distance to the centre of CU submarket
** distance to the centre of GS submarket
*** distance to the centre of YG submarket

Table 35 Sample 3 bedroom apartment data (summary)

Variable	Unit	Number of obs.	Mean	Std. dev.	Min.	Max.	Percentiles (%)				
							10	25	50	75	90
Floor area	m²	401	84.5	1.8	76.9	96.0	83.8	84.5	84.5	84.8	84.8
Distance1*	km	154	14.4	8.8	1.3	34.7	3.9	7.0	12.9	21.6	27.2
Distance2**	km	122	11.6	8.0	1.9	32.1	3.6	5.3	9.3	14.8	25.0
Distance3***	km	129	13.0	7.4	0.4	26.6	3.2	6.0	13.1	18.8	23.5
Price 1998	10 $/m²	298	201.7	61.4	83.7	396.5	123.8	159.2	195.3	237.7	278.2
Price 2001		396	170.3	65.8	68.3	430.3	98.2	114.4	162.2	204.8	253.5
Price 2004		401	266.0	133.7	68.2	828.6	130.2	178.3	237.3	310.1	467.6
Price 2007		401	372.7	221.3	67.1	1,396.8	153.3	224.0	312.5	455.8	692.5
Rent 1998		299	97.0	29.8	33.6	189.4	64.9	74.0	91.5	114.4	142.0
Rent 2001		396	102.5	37.5	36.6	247.6	59.2	73.8	100.6	122.6	153.9
Rent 2004		401	133.5	51.7	35.7	307.8	70.7	100.2	129.7	163.6	201.2
Rent 2007		401	158.6	65.0	37.4	384.7	85.5	112.5	153.3	192.4	249.6

Table 36 Sample 4 bedroom apartment data (summary)

Variable	Unit	Number of obs.	Mean	Std. dev.	Min.	Max.	Percentiles (%)				
							10	25	50	75	90
Floor area	m²	396	123.1	9.6	99.0	148.0	113.0	115.0	123.0	133.0	135.0
Distance1*	km	152	14.4	8.4	0.3	33.4	4.1	7.6	13.5	21.4	26.7
Distance2**	km	121	11.6	7.8	1.9	32.2	3.9	5.3	9.3	15.5	24.1
Distance3***	km	128	12.6	7.3	0.2	27.0	3.4	5.9	12.7	18.3	22.9
Price 1998	10 $/m²	277	200.0	77.1	73.1	458.0	113.3	140.4	188.6	243.8	300.0
Price 2001		392	186.2	80.1	70.3	504.4	105.5	124.5	171.6	226.9	289.5
Price 2004		396	270.7	128.2	73.9	802.6	143.4	182.9	247.8	315.2	443.5
Price 2007		396	391.0	215.0	77.5	1,314.4	165.9	243.7	345.0	485.1	720.0
Rent 1998		277	81.7	33.2	31.5	209.4	44.4	57.7	74.0	97.0	123.0
Rent 2001		392	96.1	42.1	35.4	280.7	52.2	66.1	85.1	115.4	152.2
Rent 2004		396	130.7	57.0	39.0	412.3	71.1	94.2	117.6	156.5	207.1
Rent 2007		396	149.2	66.3	37.4	460.5	74.4	103.1	140.5	175.4	247.9

Appendix 6-2 Sample apartment data of Seoul

Table 37 Sample 2 bedroom apartment data of Seoul

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (Jeonse*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
1	Seoul	GangNam	수서	삼익	1992.12.	650	2	1	60	279.2	266.7	666.7	758.3	145.8	175.0	270.8	291.7	E	127	6	2	N	37	29	20
2	Seoul	GangNam	일원	푸른마을	1994.02.	930	3	1	60	350.0	345.8	708.3	1041.7	166.7	220.8	316.7	333.3	E	127	4	51	N	37	29	1
3	Seoul	GangNam	일원	한솔	1993.12.	570	3	1	63	329.4	353.2	746.0	1206.3	166.7	218.3	309.5	349.2	E	127	4	36	N	37	28	54
4	Seoul	GangNam	삼성	풍림 1 차	1998.08.	252	3	1	60	258.3	312.5	583.3	675.0	120.8	195.8	291.7	291.7	E	127	3	42	N	37	30	56
5	Seoul	GangNam	대치	대치현대	1999.06.	630	2	1	60		400.0	683.3	966.7		258.3	325.0	433.3	E	127	3	39	N	37	30	3
6	Seoul	GangNam	도곡	삼성	1991.10.	231	2	1	60		375.0	791.7	950.0		225.0	283.3	316.7	E	127	2	47	N	37	29	19
7	Seoul	GangNam	일원	삼성	1987.12.	80	2	1	61	270.5	286.9	680.3	1024.6	143.4	172.1	286.9	270.5	E	127	5	1	N	37	29	35
8	Seoul	GangNam	도곡	한신	1988.05.	421	2	1	57	333.3	346.5	640.4	886.0	171.1	210.5	280.7	377.2	E	127	2	27	N	37	29	14
9	Seoul	GangNam	논현	논현경남	1996.09.	60	3	1	60		287.5	483.3	525.0		183.3	291.7	283.3	E	127	2	17	N	37	30	38
10	Seoul	GangNam	신사	로데오현대	1998.11.	139	2	1	55	295.5	345.5	609.1	727.3	136.4	236.4	263.6	336.4	E	127	2	14	N	37	31	36
11	Seoul	GangNam	청담	삼성 1 차	1997.12.	158	3	1	60		333.3	633.3	675.0		212.5	300.0	300.0	E	127	2	52	N	37	31	10
12	Seoul	GangDong	길	길동우성	1994.10.	811	2	1	57	241.2	228.1	359.6	416.7	131.6	153.5	219.3	219.3	E	127	8	38	N	37	32	13
13	Seoul	GangDong	길	신동아 4 차	1999.11.	95	2	1	57		194.7	438.6	333.3		140.4	184.2	166.7	E	127	8	52	N	37	32	28
14	Seoul	GangDong	둔촌	중앙하이츠	1995.12.	232	3	1	60	237.5	216.7	345.8	350.0	129.2	145.8	216.7	208.3	E	127	8	32	N	37	31	46
15	Seoul	GangDong	명일	명일 LG	1996.12	772	2	1	60	233.3	208.3	416.7	408.3	137.5	154.2	208.3	216.7	E	127	8	44	N	37	32	56
16	Seoul	GangDong	상일	중앙하이츠	1992.05.	410	3	1	60	216.7	190.0	366.7	525.0	120.8	137.5	175.0	200.0	E	127	9	35	N	37	33	2
17	Seoul	GangDong	성내	현대	1987.11.	277	2	1	59	199.2	199.2	355.9	457.6	114.4	131.4	211.9	220.3	E	127	8	5	N	37	32	44
18	Seoul	GangBook	우이	성원	1990.09.	262	3	1	72	163.2	142.4	184.0	218.8	100.7	97.2	125.0	118.1	E	127	0	50	N	37	39	42
19	Seoul	GangBook	번	주공 4 단지	1991.04.	900	3	1	59	178.0	188.1	248.3	288.1	110.2	114.4	152.5	161.0	E	127	2	23	N	37	37	51
20	Seoul	GangBook	번	주공 1 단지	1991.06.	1430	2	1	50	183.0	158.0	240.0	305.0	105.0	113.0	135.0	155.0	E	127	2	50	N	37	37	29
21	Seoul	GangBook	수유	수유벽산	1992.10.	1454	2	1	64	183.6	156.3	232.8	269.5	113.3	121.1	152.3	160.2	E	127	1	8	N	37	38	35
22	Seoul	GangBook	수유	극동	1990.10.	574	3	1	71	186.6	151.4	221.8	246.5	102.1	102.1	130.3	154.9	E	127	0	43	N	37	38	31
23	Seoul	GangBook	우이	대우	2000.09.	260	3	1	60		208.3	308.3	350.0		137.5	208.3	208.3	E	127	0	40	N	37	39	20
24	Seoul	GangSeo	가양	현대 2 차	2001.08.	114	3	1	60		266.7	358.3	541.7		200.0	183.3	183.3	E	126	51	20	N	37	33	41
25	Seoul	GangSeo	염창	동아	1997.10.	778	3	1	60	220.8	206.7	283.3	375.0	104.2	137.5	162.5	187.5	E	126	52	22	N	37	33	16
26	Seoul	GangSeo	등촌	태영	1998.06.	186	3	1	60	166.7	195.8	295.8	375.0	66.7	137.5	179.2	191.7	E	126	51	50	N	37	33	21
27	Seoul	GangSeo	마곡	신안	1993.12.	253	3	1	60	179.2	158.3	254.2	416.7	95.8	83.3	108.3	125.0	E	126	49	26	N	37	34	4
28	Seoul	GangSeo	방화	동성	1993.12.	686	3	1	64	242.2	226.6	335.9	445.3	121.1	144.5	191.4	210.9	E	126	48	44	N	37	34	46
29	Seoul	GangSeo	염창	삼성하나로	1994.02.	178	2	1	59	169.5	180.5	271.2	347.5	89.0	138.1	169.5	173.7	E	126	52	19	N	37	33	5
30	Seoul	GangSeo	방화	현대 2 차	1999.12.	202	2	1	59		199.2	275.4	330.5		131.4	161.0	186.4	E	126	49	10	N	37	34	23
31	Seoul	GwanAk	봉천	관악현대	1991.11.	2134	2	1	59	216.1	190.7	292.4	457.6	127.1	144.1	186.4	237.3	E	126	57	36	N	37	29	33
32	Seoul	GwanAk	봉천	낙성현대 1 차	1988.05.	251	2	1	61	217.2	217.2	336.1	409.8	127.0	151.6	184.4	239.3	E	126	57	56	N	37	28	22
33	Seoul	GwanAk	신림	신림현대	1993.05.	1634	2	1	60	225.0	212.5	285.0	400.0	137.5	145.8	191.7	200.0	E	126	55	57	N	37	28	30
34	Seoul	GwanAk	신림	건영 3 차	1991.10.	783	2	1	59	194.9	182.2	271.2	292.4	122.9	139.8	178.0	194.9	E	126	57	6	N	37	28	37
35	Seoul	GwanAk	신림	동부	1994.12.	592	3	1	60	229.2	229.2	329.2	458.3	133.3	145.8	204.2	225.0	E	126	55	45	N	37	28	50
36	Seoul	GwanAk	신림	건영 2 차	1988.01.	338	2	1	60	154.2	154.2	225.0	295.8	87.5	116.7	145.8	158.3	E	126	55	1	N	37	28	15
37	Seoul	GwanAk	신림	우방	1999.11.	201	3	1	60		245.8	304.2	341.7		170.8	208.3	233.3	E	126	55	8	N	37	29	20
38	Seoul	GwanAk	신림	쌍용	1998.01.	373	2	1	59	194.9	194.9	262.7	309.3	110.2	127.1	161.0	156.8	E	126	54	42	N	37	28	20
39	Seoul	GwangJin	광장	삼성 2 차	1988.11.	195	2	1	59	233.1	216.1	432.2	559.3	139.8	148.3	233.1	279.7	E	127	6	7	N	37	32	32
40	Seoul	GwangJin	광장	청구	1995.11.	654	3	1	60	266.7	241.7	416.7	541.7	154.2	166.7	241.7	266.7	E	127	5	46	N	37	32	33
41	Seoul	GwangJin	군자	일성파크	1996.01.	357	3	1	60		200.0	291.7	375.0		120.8	191.7	195.8	E	127	4	21	N	37	33	4
42	Seoul	GwangJin	중곡	선경	1999.09.	182	2	1	58		232.8	310.3	353.4		133.6	198.3	254.3	E	127	5	11	N	37	34	8
43	Seoul	GwangJin	자양	한라	1996.02.	329	2	1	60	241.7	229.2	395.8	500.0	137.5	150.0	216.7	241.7	E	127	4	12	N	37	32	7
44	Seoul	GwangJin	자양	현대 6 차	1999.02.	178	3	1	60		245.8	450.0	633.3		158.3	241.7	266.7	E	127	4	18	N	37	31	58
45	Seoul	GooRo	개봉	삼환	1995.11.	783	3	1	59	207.6	173.7	258.5	288.1	105.9	122.9	165.3	169.5	E	126	51	16	N	37	29	40
46	Seoul	GooRo	고척	청구	1998.09.	448	2	1	60	151.7	200.0	258.3	304.2	73.3	129.2	158.3	158.3	E	126	51	50	N	37	30	5
47	Seoul	GooRo	구로	럭키	1993.03.	427	2	1	60	212.5	187.5	283.3	290.0	120.8	139.2	191.7	191.7	E	126	53	38	N	37	29	31
48	Seoul	GooRo	구로	구일우성	1998.01.	829	2	1	59	165.3	165.3	227.1	339.0	89.0	131.4	148.3	190.7	E	126	52	37	N	37	29	25
49	Seoul	GooRo	신도림	동아 1 차	1999.11.	1095	3	1	60		250.0	370.8	491.7		154.2	220.8	220.8	E	126	52	59	N	37	30	39
50	Seoul	GooRo	오류	동부	1996.08.	252	3	1	60	170.8	162.5	225.0	237.5	80.8	112.5	154.2	150.0	E	126	50	52	N	37	29	49

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (Jeonse*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
51	Seoul	GeumCheon	가산	두산	1997.12.	1495	3	1	60	208.3	208.3	304.2	375.0	95.8	133.3	175.0	208.3	E	126	53	33	N	37	28	28
52	Seoul	GeumCheon	독산	독산현대	1997.03.	204	3	1	60	191.7	175.0	250.0	254.2	104.2	120.8	158.3	158.3	E	126	53	42	N	37	28	2
53	Seoul	GeumCheon	독산	동아	1997.08.	106	3	1	60	181.7	179.2	225.0	241.7	95.8	112.5	150.0	154.2	E	126	54	23	N	37	28	12
54	Seoul	GeumCheon	시흥	남서울건영 2 차	1989.07.	619	2	1	64	156.3	144.5	226.6	234.4	97.7	105.5	132.8	148.4	E	126	54	39	N	37	26	57
55	Seoul	GeumCheon	시흥	성지	1986.09.	233	2	1	55	161.8	150.0	272.7	281.8	95.5	109.1	136.4	136.4	E	126	53	53	N	37	27	3
56	Seoul	NoWon	공릉	삼익	1995.10.	845	2	1	51	181.4	166.7	245.1	0.0	102.9	122.5	161.8	0.0	E	127	4	55	N	37	37	36
57	Seoul	NoWon	상계	성원	1998.01.	174	2	1	60	166.7	175.0	220.8	266.7	95.8	137.5	154.2	158.3	E	127	3	57	N	37	39	37
58	Seoul	NoWon	상계	중앙하이츠	1997.10.	437	3	1	61	188.5	196.7	262.3	323.8	106.6	135.2	168.0	204.9	E	127	4	8	N	37	39	13
59	Seoul	NoWon	상계	불암대림	1999.07.	634	2	1	59		199.2	262.7	288.1		135.6	165.3	186.4	E	127	4	38	N	37	39	48
60	Seoul	NoWon	월계	서광	1994.07.	274	3	1	60	204.2	162.5	258.3	262.5	100.0	108.3	129.2	157.5	E	127	3	54	N	37	37	23
61	Seoul	NoWon	중계	성원	1996.02.	402	3	1	60		204.2	333.3	416.7		130.0	200.0	250.0	E	127	4	11	N	37	39	0
62	Seoul	NoWon	중계	경남	1989.07.	660	2	1	50	162.0	157.0	245.0	290.0	103.0	125.0	160.0	180.0	E	127	3	45	N	37	38	21
63	Seoul	NoWon	하계	벽산	1988.05.	630	2	1	58	159.5	159.5	237.1	306.0	107.8	125.0	150.9	181.0	E	127	3	54	N	37	38	8
64	Seoul	DoBong	도봉	현대성우	1998.12.	190	2	1	60	150.0	175.0	225.0	300.0	91.7	116.7	133.3	145.8	E	127	2	52	N	37	40	35
65	Seoul	DoBong	방학	벽산	1996.11.	318	2	1	52	153.8	139.4	192.3	192.3	101.0	110.6	129.8	134.6	E	127	1	30	N	37	39	31
66	Seoul	DoBong	방학	신동아 2 단지	1991.09.	660	3	1	73	181.5	164.4	198.6	226.0	92.5	95.9	133.6	123.3	E	127	1	34	N	37	39	37
67	Seoul	DoBong	쌍문	극동	1995.07.	315	3	1	60	201.7	170.8	229.2	266.7	106.7	108.3	141.7	150.0	E	127	1	38	N	37	39	5
68	Seoul	DoBong	창	대우	1995.11.	952	2	1	60	220.8	183.3	254.2	258.3	112.5	127.5	158.3	158.3	E	127	2	15	N	37	38	32
69	Seoul	DoBong	창	쌍용	1997.02.	1352	3	1	60	233.3	229.2	316.7	366.7	120.8	141.7	183.3	216.7	E	127	2	53	N	37	39	35
70	Seoul	DongDaeMoon	답십리	신답경남	1991.07.	225	2	1	59	186.4	173.7	300.8	300.8	114.4	122.9	156.8	156.8	E	127	2	40	N	37	34	29
71	Seoul	DongDaeMoon	답십리	동답한신	1991.12.	600	3	1	59	194.9	176.3	258.5	279.7	114.4	127.1	165.3	156.8	E	127	3	45	N	37	34	15
72	Seoul	DongDaeMoon	용두	신동아	1992.12.	772	2	1	59	211.9	182.2	309.3	313.6	139.8	139.8	178.0	194.9	E	127	1	56	N	37	34	21
73	Seoul	DongDaeMoon	이문	삼익	1997.08.	353	3	1	60	187.5	175.0	266.7	266.7	104.2	120.8	175.0	183.3	E	127	4	33	N	37	35	45
74	Seoul	DongDaeMoon	전농	우성	1991.07.	1234	2	1	60	183.3	170.8	241.7	275.0	120.8	120.8	162.5	162.5	E	127	3	54	N	37	34	38
75	Seoul	DongDaeMoon	회기	신현대	1989.05.	736	2	1	56	214.3	192.0	290.2	308.0	138.4	142.9	192.0	192.0	E	127	3	6	N	37	35	22
76	Seoul	DongJak	노량진	우성	1995.11.	901	2	1	60	237.5	208.3	325.0	433.3	129.2	141.7	225.0	254.2	E	126	56	52	N	37	30	34
77	Seoul	DongJak	대방	대림	1993.10.	1628	3	1	60	275.0	258.3	395.8	550.0	150.0	170.8	237.5	275.0	E	126	55	28	N	37	30	27
78	Seoul	DongJak	본	신동아	1993.07.	765	2	1	60	208.3	212.5	337.5	466.7	137.5	145.8	158.3	216.7	E	126	57	6	N	37	30	36
79	Seoul	DongJak	사당	극동	1992.10.	1550	2	1	52	240.4	254.8	379.8	480.8	139.4	168.3	226.0	254.8	E	126	58	29	N	37	29	26
80	Seoul	DongJak	노량진	상도건영	1997.08.	824	3	1	63	242.1	261.9	388.9	460.3	138.9	150.8	230.2	261.9	E	126	56	58	N	37	30	27
81	Seoul	DongJak	신대방	한성	1994.12.	272	3	1	60	250.0	229.2	358.3	433.3	137.5	154.2	216.7	250.0	E	126	54	55	N	37	29	44
82	Seoul	Mapo	공덕	공덕현대	1989.01.	183	2	1	52	173.1	182.7	307.7	403.8	134.6	139.4	192.3	201.9	E	126	57	0	N	37	32	53
83	Seoul	Mapo	도화	우성	1991.03.	1230	2	1	55	268.2	222.7	372.7	490.9	159.1	168.2	209.1	218.2	E	126	56	54	N	37	32	10
84	Seoul	Mapo	도화	현대 1 차	1993.08.	1021	2	1	55	240.9	236.4	336.4	509.1	140.9	150.0	227.3	236.4	E	126	57	14	N	37	32	22
85	Seoul	Mapo	신수	삼익	1996.11.	391	3	1	60	225.0	237.5	375.0	416.7	137.5	162.5	245.8	258.3	E	126	56	8	N	37	33	4
86	Seoul	Mapo	연남	대명	1996.01.	128	2	1	55		227.3	272.7	345.5		136.4	200.0	209.1	E	126	55	25	N	37	33	42
87	Seoul	Mapo	중	현대 1 차	2000.04.	477	3	1	60		216.7	375.0	375.0		137.5	191.7	225.0	E	126	54	25	N	37	34	16
88	Seoul	SeoDaeMoon	북가좌	한양	1986.12.	660	2	1	65	180.8	161.5	265.4	315.4	111.5	103.8	153.8	150.0	E	126	54	32	N	37	34	33
89	Seoul	SeoDaeMoon	대현	럭키대현	1993.04.	855	2	1	60	250.0	233.3	316.7	383.3	150.0	154.2	212.5	241.7	E	126	56	52	N	37	33	34
90	Seoul	SeoDaeMoon	북아현	경남 1 차	1995.10.	106	2	1	60	225.0	237.5	300.0	391.7	129.2	162.5	191.7	200.0	E	126	57	27	N	37	33	41
91	Seoul	SeoDaeMoon	남가좌	현대	1998.10.	1485	2	1	59	182.2	216.1	313.6	355.9	89.0	148.3	178.0	194.9	E	126	55	14	N	37	34	28
92	Seoul	SeoDaeMoon	홍은	벽산	1995.04.	1509	2	1	59	190.7	190.7	283.9	288.1	139.8	139.8	178.0	194.9	E	126	56	41	N	37	35	41
93	Seoul	SeoDaeMoon	홍은	풍림 2 차	1989.09.	390	3	1	58	202.6	163.8	250.0	254.3	133.6	137.9	163.8	176.7	E	126	56	34	N	37	35	35
94	Seoul	SeoDaeMoon	홍제	한양	1992.07.	998	2	1	60	220.8	195.8	300.0	337.5	129.2	154.2	191.7	212.5	E	126	56	49	N	37	34	59
95	Seoul	SeoDaeMoon	홍제	홍제현대	1992.01.	704	2	1	60	233.3	208.3	291.7	316.7	129.2	141.7	200.0	183.3	E	126	56	28	N	37	35	20
96	Seoul	SeoCho	반포	새서울	1994.07.	154	2	1	60	279.2	258.3	566.7	583.3	141.7	200.0	275.0	283.3	E	127	0	36	N	37	29	57
97	Seoul	SeoCho	반포	한신서래	1988.01.	414	3	1	64	273.4	257.8	523.4	757.8	143.0	168.0	257.8	468.8	E	127	2	3	N	37	29	57
98	Seoul	SeoCho	방배	삼호한숲	1998.10.	116	3	1	59	279.7	339.0	567.8	669.5	144.1	211.9	322.0	372.9	E	126	59	56	N	37	28	40
99	Seoul	SeoCho	서초	한빛삼성	1999.12.	264	2	2	60		375.0	616.7	750.0		233.3	291.7	375.0	E	127	0	28	N	37	29	18
100	Seoul	SeoCho	서초	서초현대	1999.12.	299	2	1	63		381.0	579.4	730.2		238.1	309.5	333.3	E	127	1	13	N	37	29	27
101	Seoul	SeoCho	서초	우성 5 차	1996.05.	408	2	1	57	280.7	350.9	605.3	921.1	166.7	236.8	289.5	333.3	E	127	1	36	N	37	29	40
102	Seoul	SeoCho	양재	우성	1990.12.	997	3	1	73	260.3	256.8	493.2	828.8	126.7	174.7	239.7	274.0	E	127	1	50	N	37	28	31
103	Seoul	SeoCho	우면	코오롱	1994.09.	300	2	1	52	326.9	317.3	596.2	865.4	158.7	197.1	278.8	307.7	E	127	1	40	N	37	28	21
104	Seoul	SeoCho	잠원	잠원현대훼밀리	1997.07.	113	3	1	60	283.3	325.0	604.2	791.7	191.7	225.0	283.3	333.3	E	127	0	53	N	37	31	9
105	Seoul	SeongDong	금호	두산	1993.12.	1267	2	1	60	266.7	233.3	366.7	475.0	154.2	162.5	216.7	241.7	E	127	0	58	N	37	32	59
106	Seoul	SeongDong	성수	현대그린	1994.11.	219	2	1	57		254.4	377.2	543.9		153.5	201.8	210.5	E	127	2	59	N	37	32	26
107	Seoul	SeongDong	옥수	극동그린	1996.06.	583	2	1	60	275.0	283.3	433.3	516.7	162.5	191.7	266.7	266.7	E	127	0	36	N	37	32	30
108	Seoul	SeongDong	응봉	신동아	1996.04.	434	2	1	60	216.7	191.7	308.3	325.0	129.2	137.5	191.7	191.7	E	127	1	45	N	37	32	59
109	Seoul	SeongDong	하왕십리	청계벽산	1996.12.	1332	3	1	71	250.0	235.9	422.5	443.7	119.7	147.9	176.1	211.3	E	127	1	54	N	37	34	7
110	Seoul	SeongDong	행당	신동아	1995.07.	636	2	1	60	216.7	200.0	308.3	370.8	129.2	145.8	191.7	208.3	E	127	1	57	N	37	33	14

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (Jeonse*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
111	Seoul	SeongDong	행당	삼부	1997.11.	498	3	1	68	242.6	261.0	360.3	470.6	143.4	154.4	213.2	235.3	E	127	2	15	N	37	33	35
112	Seoul	SeongBook	길음	삼부	1992.09.	684	2	1	60	179.2	179.2	279.2	333.3	112.5	141.7	175.0	175.0	E	127	1	25	N	37	36	9
113	Seoul	SeongBook	돈암	현대	1991.06.	619	2	1	60	175.0	183.3	241.7	270.8	100.0	133.3	158.3	175.0	E	127	1	41	N	37	36	15
114	Seoul	SeongBook	동소문	송산	1997.08.	345	2	1	59	224.6	216.1	279.7	271.2	131.4	156.8	194.9	190.7	E	127	0	38	N	37	35	33
115	Seoul	SeongBook	상월곡	우남	1994.11.	225	2	1	63	230.2	182.5	238.1	254.0	123.0	131.0	142.9	146.8	E	127	2	48	N	37	36	21
116	Seoul	SeongBook	종암	선경종암	1995.10.	238	2	1	60	220.8	212.5	275.0	291.7	125.0	137.5	191.7	216.7	E	127	2	1	N	37	35	39
117	Seoul	SeongBook	하월곡	아남	1996.12.	198	2	1	60	220.8	208.3	254.2	308.3	120.8	145.8	162.5	175.0	E	127	2	5	N	37	36	20
118	Seoul	SongPa	가락	우성	1986.12.	838	2	1	58	250.0	254.3	482.8	814.7	140.5	172.4	232.8	258.6	E	127	7	4	N	37	29	49
119	Seoul	SongPa	방이	신동아	1995.06.	96	2	1	50	245.0	215.0	298.0	310.0	135.0	150.0	210.0	210.0	E	127	6	40	N	37	30	56
120	Seoul	SongPa	거여	우방	1999.05.	257	3	1	60		229.2	383.3	466.7		154.2	216.7	216.7	E	127	8	32	N	37	29	33
121	Seoul	SongPa	송파	성지	1992.09.	298	2	1	66	265.2	234.8	439.4	590.9	140.2	159.1	219.7	257.6	E	127	7	2	N	37	30	1
122	Seoul	SongPa	오금	우방	2000.12.	196	2	1	60		245.8	375.0	470.8		158.3	216.7	237.5	E	127	8	23	N	37	30	5
123	Seoul	SongPa	문정	동아	1996.11.	78	3	1	71		193.7	345.1	422.5		140.8	176.1	197.2	E	127	7	43	N	37	29	16
124	Seoul	SongPa	잠실	우성 4 차	1983.09.	555	2	1	81	185.2	194.4	463.0	672.8	104.9	114.2	197.5	185.2	E	127	4	58	N	37	30	10
125	Seoul	SongPa	풍납	갑을	1996.07.	85	3	1	60		195.8	320.8	375.0		137.5	190.0	208.3	E	127	6	45	N	37	32	7
126	Seoul	YangCheon	목	금호	1997.10.	224	3	1	60	250.0	258.3	475.0	808.3	108.3	175.0	241.7	300.0	E	126	52	29	N	37	31	31
127	Seoul	YangCheon	목	삼익	1997.06.	277	2	1	60	241.7	241.7	416.7	425.0	129.2	162.5	241.7	233.3	E	126	52	35	N	37	31	23
128	Seoul	YangCheon	목	성원	1997.02.	200	2	1	58	267.2	267.2	413.8	534.5	125.0	168.1	215.5	241.4	E	126	52	9	N	37	31	35
129	Seoul	YangCheon	신월	성원	1997.01.	170	2	1	60	0.0	145.8	212.5	175.0		104.2	137.5	116.7	E	126	50	1	N	37	31	41
130	Seoul	YangCheon	신정	목동현대	1996.04.	2076	3	1	71	235.9	232.4	415.5	605.6	105.6	144.4	204.2	246.5	E	126	52	37	N	37	31	13
131	Seoul	YeongDeungPo	당산	강마을삼성	1995.05.	348	3	1	60		250.0	366.7	485.0		154.2	216.7	258.3	E	126	54	21	N	37	32	3
132	Seoul	YeongDeungPo	대림	한신 1 차	1998.12.	143	3	1	60		216.7	308.3	358.3		129.2	204.2	208.3	E	126	54	14	N	37	29	41
133	Seoul	YeongDeungPo	도림	한라	1998.08.	142	3	1	60	200.0	175.0	245.8	275.0	100.0	125.0	175.0	191.7	E	126	53	51	N	37	30	27
134	Seoul	YeongDeungPo	신길	한성	1997.04.	420	3	1	60	241.7	266.7	366.7	383.3	120.8	166.7	225.0	241.7	E	126	55	9	N	37	30	17
135	Seoul	YeongDeungPo	양평	한신	1990.01.	457	3	1	60	208.3	191.7	316.7	425.0	112.5	129.2	170.8	191.7	E	126	53	32	N	37	32	24
136	Seoul	YeongDeungPo	여의도	미성	1978.06.	577	3	1	74	283.8	277.0	560.8	912.2	141.9	165.5	223.0	216.2	E	126	55	28	N	37	31	11
137	Seoul	YongSan	보광	삼성리버빌	2000.10.	242	3	1	60		258.3	400.0	541.7		175.0	233.3	225.0	E	127	0	4	N	37	31	27
138	Seoul	YongSan	산천	한강타운	1999.11.	285	3	1	60		216.7	341.7	391.7		158.3	191.7	241.7	E	126	56	59	N	37	32	9
139	Seoul	YongSan	이촌	대림	1994.05.	638	2	1	59	254.2	254.2	428.0	728.8	135.6	148.3	211.9	211.9	E	126	57	18	N	37	31	29
140	Seoul	YongSan	이촌	현대한강	1996.10.	516	3	1	60	304.2	300.0	525.0	775.0	158.3	175.0	225.0	250.0	E	126	57	30	N	37	31	22
141	Seoul	YongSan	이태원	남산대림	1994.10.	400	3	1	60	375.0	366.7	500.0	716.7	200.0	208.3	283.3	283.3	E	126	59	19	N	37	32	27
142	Seoul	EunPyung	녹번	현대	1989.05.	132	2	1	62	173.4	169.4	205.6	290.3	100.8	112.9	157.3	225.8	E	126	55	45	N	37	36	18
143	Seoul	EunPyung	불광	미성	1988.06.	1340	2	1	65	203.8	188.5	292.3	434.6	119.2	126.9	169.2	192.3	E	126	55	41	N	37	36	53
144	Seoul	EunPyung	신사	라이프시티	1992.12.	298	3	1	60	170.8	154.2	200.0	220.8	106.7	108.3	137.5	125.0	E	126	54	19	N	37	36	8
145	Seoul	EunPyung	신사	신성	1988.04.	238	2	1	56	151.8	142.9	214.3	223.2	93.8	111.6	147.3	142.9	E	126	54	19	N	37	35	23
146	Seoul	EunPyung	응암	경남	1995.12.	160	2	1	59	207.6	165.3	216.1	241.5	118.6	122.9	156.8	169.5	E	126	55	13	N	37	34	59
147	Seoul	EunPyung	응암	우성	1988.07.	292	2	1	64	156.3	152.3	179.7	203.1	101.6	113.3	152.3	132.8	E	126	55	5	N	37	35	2
148	Seoul	JongRo	교북	동아	1995.11.	48	2	1	60			316.7	383.3			200.0	216.7	E	126	57	43	N	37	34	17
149	Seoul	JongRo	명륜	명륜아남 3 차	1999.01.	136	2	1	59		300.8	406.8	474.6		224.6	266.9	275.4	E	127	0	0	N	37	35	8
150	Seoul	JongRo	무악	현대	1999.11.	1514	3	1	60		283.3	433.3	420.8		175.0	266.7	279.2	E	126	57	39	N	37	34	31
151	Seoul	JongRo	창신	쌍용 2 차	1993.06.	919	2	1	55	204.5	181.8	263.6	290.9	122.7	134.5	172.7	172.7	E	127	0	43	N	37	34	49
152	Seoul	JongRo	평창	삼성	1998.01	176	3	1	60		220.8	283.3	287.5	0.0	145.8	191.7	200.0	E	126	58	43	N	37	36	39
153	Seoul	Joong	신당	현대	1990.06.	942	3	1	66	204.5	189.4	318.2	363.6	121.2	125.0	189.4	197.0	E	127	1	17	N	37	33	35
154	Seoul	Joong	신당	남산타운	2000.06.	5150	3	1	53		372.6	528.3	622.6		235.8	283.0	330.2	E	127	0	35	N	37	32	59
155	Seoul	JoongRang	면목	신성	1998.10.	266	3	1	60	154.2	175.0	275.0	275.0	79.2	116.7	162.5	170.8	E	127	4	22	N	37	30	25
156	Seoul	JoongRang	면목	두산 1 차	1993.12.	122	2	1	60		200.0	275.0	283.3		145.8	175.0	183.3	E	127	5	2	N	37	34	53
157	Seoul	JoongRang	상봉	LG 쌍용	1996.02.	858	3	1	68	227.9	187.5	268.4	323.5	106.6	114.0	154.4	183.8	E	127	5	23	N	37	36	11
158	Seoul	JoongRang	신내	동성 3 차	1995.07.	1844	3	1	59	207.6	178.0	245.8	305.1	114.4	122.9	148.3	186.4	E	127	5	45	N	37	36	29
159	Seoul	JoongRang	신내	두산화성	1995.12.	763	3	1	67	246.3	194.0	287.3	358.2	104.5	123.1	164.2	197.8	E	127	5	42	N	37	36	47
160	Seoul	JoongRang	중화	한신	1996.09.	1544	2	1	50	205.0	195.0	270.0	300.0	135.0	140.0	185.0	190.0	E	127	4	53	N	37	35	48
161	InCheon	GangHwa	강화	현대	1994.04.	219	3	1	59		105.9	122.9	131.4		50.8	72.0	63.6	E	126	29	8	N	37	44	46
162	InCheon	GyeYang	계산	극동	1987.01.	630	2	1	53	115.1	117.9	193.4	221.7	53.8	69.8	89.6	99.1	E	126	43	26	N	37	32	46
163	InCheon	GyeYang	오류	신동아	1998.09.	1192	3	1	60		129.2	179.2	204.2		66.7	91.7	104.2	E	126	44	0	N	37	34	50
164	InCheon	GyeYang	계산	현대	1992.02.	1248	3	1	69	134.1	131.9	199.3	235.5	58.0	90.6	126.8	134.1	E	126	43	58	N	37	32	14
165	InCheon	GyeYang	작전	동보 1 차	1995.10.	1187	3	1	60		121.7	170.8	166.7		87.5	120.8	112.5	E	126	44	21	N	37	31	56
166	InCheon	GyeYang	효성	현대 1 차	1992.01.	874	3	1	71	118.3	109.2	179.6	204.2	59.9	73.9	116.2	116.2	E	126	42	50	N	37	31	59
167	InCheon	Nam	관교	신비마을	1994.05.	960	2	1	60	131.7	113.3	165.0	183.3	79.2	77.5	112.5	120.8	E	126	41	12	N	37	26	42
168	InCheon	Nam	주안	진흥	1994.01.	828	3	1	60	131.7	145.8	229.2	220.8	70.8	95.8	129.2	150.0	E	126	40	56	N	37	26	47
169	InCheon	Nam	도화	나산	1997.07.	211	3	1	59	144.1	139.8	186.4	173.7	80.5	80.5	93.2	118.6	E	126	40	2	N	37	27	54
170	InCheon	Nam	숭의	극동	1997.10.	133	3	1	58		121.6	159.5	181.0		64.7	86.2	99.1	E	126	38	54	N	37	28	3

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $\$/m^2$)				Rent (Jeonse*) (10 US $\$/m^2$)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
171	InCheon	Nam	용현	한국	1996.07.	297	3	1	59		123.7	178.0	186.4		79.7	114.4	122.9	E	126	38	19	N	37	26	47
172	InCheon	Nam	주안	쌍용	1985.12.	768	2	1	71	88.0	93.0	154.9	146.5	45.8	57.7	81.0	88.0	E	126	40	48	N	37	26	48
173	InCheon	Nam	학익	신동아 5 차	1993.06.	594	2	1	57	111.4	120.2	177.2	184.2	76.3	74.6	127.2	127.2	E	126	40	39	N	37	26	36
174	InCheon	NamDong	간석	금호	1988.10.	630	2	1	59	109.3	111.9	200.8	199.2	64.4	89.8	144.1	138.1	E	126	41	58	N	37	27	28
175	InCheon	NamDong	간석	극동	1989.05.	760	2	1	56	114.3	111.6	198.2	198.2	64.3	89.3	138.4	129.5	E	126	42	58	N	37	27	21
176	InCheon	NamDong	구월	벽산	1989.11.	150	2	1	54	60.2	78.7	138.9	115.7	46.3	50.0	88.0	81.5	E	126	43	30	N	37	26	58
177	InCheon	NamDong	만수	효성상아 1 차	1985.07.	720	3	1	60	126.7	113.3	158.3	179.2	79.2	91.7	108.3	125.0	E	126	43	21	N	37	27	27
178	InCheon	NamDong	만수	신동아	1990.06.	750	3	1	67	104.5	110.4	164.2	156.7	70.9	85.8	115.7	115.7	E	126	44	13	N	37	27	59
179	InCheon	NamDong	남촌	풍림 3 차	1999.10.	735	3	1	59		146.6	216.1	199.2		89.0	139.8	127.1	E	126	42	59	N	37	25	44
180	InCheon	Dong	송현	동부	1992.01.	1140	2	1	57	100.9	107.0	143.0	148.2	48.2	68.4	74.6	92.1	E	126	38	6	N	37	28	56
181	InCheon	BooPyung	갈산	동아	1993.06.	280	2	1	59	122.0	119.5	186.4	190.7	72.0	89.8	122.9	131.4	E	126	43	47	N	37	30	39
182	InCheon	BooPyung	부개	현대	1993.05.	200	2	1	60		129.2	162.5	191.7		95.8	125.0	125.0	E	126	44	28	N	37	29	14
183	InCheon	BooPyung	부평	동아 2 차	1995.02.	2128	3	1	60	154.2	147.5	212.5	250.0	87.5	104.2	141.7	154.2	E	126	43	6	N	37	29	47
184	InCheon	BooPyung	부평	대림	1989.12.	1470	2	1	50	117.0	125.0	177.0	195.0	85.0	95.0	132.0	145.0	E	126	43	2	N	37	30	7
185	InCheon	BooPyung	산곡	현대 5 차	1993.12.	1161	3	1	59	131.4	122.0	194.9	173.7	72.0	89.0	135.6	139.8	E	126	42	38	N	37	30	20
186	InCheon	BooPyung	산곡	우성 5 차	1996.12.	299	3	1	60		112.5	175.0	175.0		87.5	112.5	123.3	E	126	42	16	N	37	29	59
187	InCheon	BooPyung	청천	쌍용	1990.09.	510	2	1	56	102.7	108.9	169.6	175.0	67.0	86.6	120.5	117.0	E	126	42	57	N	37	30	25
188	InCheon	Seo	가정	하나 2 차	1992.02.	495	2	1	58	93.1	86.2	114.7	142.2	52.6	57.8	81.9	77.6	E	126	41	2	N	37	31	36
189	InCheon	Seo	가좌	진주 3 단지	1989.12.	798	2	1	59	114.4	102.5	165.3	161.9	76.3	78.8	114.4	105.9	E	126	40	57	N	37	29	32
190	InCheon	Seo	왕길	원흥	1993.07.	354	2	1	60	90.0	73.3	120.8	186.7	48.3	48.3	62.5	70.8	E	126	39	2	N	37	36	0
191	InCheon	Seo	가좌	범양	1990.07.	510	3	1	70	125.0	117.9	203.6	185.7	78.6	78.6	117.9	117.9	E	126	41	17	N	37	29	44
192	InCheon	Seo	마전	동아	1998.11.	1351	3	1	60		118.3	160.0	250.0		66.7	87.5	104.2	E	126	40	22	N	37	35	50
193	InCheon	Seo	심곡	삼성	1997.06.	421	3	1	60		123.3	181.7	216.7		79.2	108.3	116.7	E	126	40	12	N	37	32	40
194	InCheon	Seo	연희	한국 1 차	1994.10.	356	2	1	58	124.1	105.2	150.9	185.3	69.0	69.0	94.8	116.4	E	126	40	31	N	37	33	3
195	InCheon	YeonSoo	동춘	무지개마을	1995.08.	1068	3	1	60	147.5	141.7	258.3	270.8	79.2	95.8	150.0	150.0	E	126	40	15	N	37	24	5
196	InCheon	YeonSoo	동춘	대림 3 차	1993.07.	408	2	1	53	133.0	127.4	193.4	205.7	71.7	91.5	136.8	141.5	E	126	40	0	N	37	24	25
197	InCheon	YeonSoo	선학	대동	1992.06.	390	3	1	73	114.4	113.0	178.1	188.4	65.1	85.6	119.9	119.9	E	126	42	8	N	37	25	28
198	InCheon	YeonSoo	선학	대진	1991.01.	300	2	1	64	82.0	87.5	147.7	171.9	46.9	60.9	101.6	117.2	E	126	41	59	N	37	25	20
199	InCheon	YeonSoo	연수	풍림 1 차	1992.03.	769	3	1	69	123.9	118.8	210.1	202.9	65.2	83.3	141.3	137.7	E	126	41	31	N	37	25	3
200	InCheon	YeonSoo	연수	대림	1993.05.	640	3	1	62	137.1	130.6	234.7	255.6	72.6	91.1	149.2	161.3	E	126	41	38	N	37	25	10
201	InCheon	YeonSoo	옥련	우성	1996.01.	498	3	1	60	129.2	137.5	212.5	215.0	70.8	87.5	125.0	150.0	E	126	38	50	N	37	25	25
202	InCheon	YeonSoo	옥련	현대 5 차	1997.07.	621	3	1	60	152.5	145.8	212.5	205.8	75.8	95.8	133.3	145.8	E	126	38	47	N	37	25	38
203	InCheon	YeonSoo	옥련	쌍용	1998.08.	574	3	1	60	129.2	142.5	215.0	225.0	62.5	87.5	129.2	138.3	E	126	39	12	N	37	25	30
204	GyeongGi	GoYang	고양	삼성	1998.11.	282	3	1	60		142.5	185.8	201.7	0.0	83.3	129.2	120.8	E	126	54	9	N	37	42	10
205	GyeongGi	GoYang	고양	현대	1997.11.	791	3	1	60		137.5	179.2	208.3	0.0	83.3	120.8	125.0	E	126	54	0	N	37	42	4
206	GyeongGi	GoYang	대화	장성동부	1995.11.	410	2	1	52	187.5	173.1	245.2	312.5	91.3	120.2	149.0	158.7	E	126	44	45	N	37	40	29
207	GyeongGi	GoYang	마두	백마한성	1994.12.	576	2	1	50	175.0	165.0	240.0	290.0	95.0	115.0	145.0	160.0	E	126	47	33	N	37	39	30
208	GyeongGi	GoYang	마두	백마벽산	1994.08.	438	3	1	60	183.3	170.8	258.3	375.0	87.5	112.5	175.0	175.0	E	126	47	22	N	37	39	28
209	GyeongGi	GoYang	백석	백송대우	1994.06.	228	2	1	59	156.8	148.3	211.9	203.4	84.7	101.7	135.6	135.6	E	126	47	41	N	37	39	14
210	GyeongGi	GoYang	백석	흰돌국제한진	1994.08.	816	2	1	49	186.7	178.6	280.6	326.5	104.1	132.7	173.5	188.8	E	126	47	2	N	37	38	38
211	GyeongGi	GoYang	성사	신원당동문	1992.10.	354	3	1	63	166.7	158.7	222.2	301.6	91.3	115.1	142.9	166.7	E	126	50	22	N	37	39	11
212	GyeongGi	GoYang	성사	신원당태영	1993.11.	604	2	1	55	150.0	146.4	209.1	272.7	86.4	104.5	140.9	154.5	E	126	50	4	N	37	39	5
213	GyeongGi	GoYang	중산	중산마을 1 단지두산	1995.11.	888	3	1	60	170.8	148.3	190.0	270.8	81.7	95.0	120.8	141.7	E	126	46	51	N	37	41	51
214	GyeongGi	GoYang	일산	후곡코오롱	1995.10.	474	2	1	49	178.6	168.4	260.2	306.1	96.9	117.3	148.0	137.8	E	126	46	6	N	37	40	33
215	GyeongGi	GoYang	일산	에이스	1994.12.	332	2	1	59	139.8	128.0	161.0	216.1	72.0	89.0	122.9	118.6	E	126	46	35	N	37	41	16
216	GyeongGi	GoYang	장항	호수청구	1994.03.	668	2	1	50	205.0	190.0	315.0	350.0	103.0	125.0	200.0	210.0	E	126	46	34	N	37	39	0
217	GyeongGi	GoYang	주엽	강선 LG	1993.01.	483	3	1	60	191.7	191.7	287.5	387.5	90.0	129.2	158.3	204.2	E	126	45	59	N	37	40	11
218	GyeongGi	GoYang	주엽	문촌우성 1 단지	1994.12.	892	2	1	50	185.0	165.0	245.0	285.0	95.0	115.0	145.0	165.0	E	126	45	30	N	37	40	40
219	GyeongGi	GoYang	탄현	탄현건영 5	1995.03.	624	3	1	68	160.3	134.6	186.0	338.2	73.5	78.7	106.6	128.7	E	126	45	58	N	37	41	46
220	GyeongGi	GoYang	행신	무원두산	1995.01.	688	3	1	71	197.2	169.0	281.7	369.7	88.0	102.1	137.3	162.0	E	126	49	52	N	37	36	49
221	GyeongGi	GoYang	행신	소만동성	1994.11.	377	2	1	60	158.3	150.0	208.3	275.0	79.2	104.2	129.2	147.5	E	126	50	39	N	37	36	58
222	GyeongGi	GoYang	화정	달빛부영	1996.07.	1391	3	1	60	183.3	170.8	233.3	279.2	87.5	112.5	145.8	162.5	E	126	50	11	N	37	38	50
223	GyeongGi	GoYang	화정	옥빛풍산	1996.06.	112	3	1	60	200.0	166.7	245.8	283.3	91.7	112.5	154.2	158.3	E	126	50	2	N	37	37	49
224	GyeongGi	GoYang	화정	별빛부영	1995.12.	1232	3	1	60	202.5	179.2	265.0	375.0	95.8	116.7	95.8	208.3	E	126	49	43	N	37	37	55
225	GyeongGi	GwangMyung	광명	중앙하이츠 1 차	1993.07.	909	2	1	49	148.0	144.9	224.5	250.0	86.7	102.0	148.0	173.5	E	126	51	18	N	37	28	9
226	GyeongGi	GwangMyung	소하	미도 2 차	1993.03.	193	2	1	60	150.0	148.3	308.3	241.7	87.5	104.2	141.7	145.8	E	126	52	36	N	37	26	11
227	GyeongGi	GwangMyung	소하	성원	1994.05.	193	2	1	67	134.3	135.1	279.9	246.3	82.1	93.3	126.9	126.9	E	126	52	37	N	37	26	7
228	GyeongGi	GwangMyung	철산	쌍마한신	1992.11.	384	2	1	66	185.6	174.2	287.9	318.2	98.5	117.4	143.9	166.7	E	126	52	4	N	37	28	37
229	GyeongGi	GwangMyung	하안	현대	1995.11.	593	2	1	53	155.7	144.3	278.3	250.0	89.6	103.8	141.5	155.7	E	126	51	50	N	37	28	5
230	GyeongGi	GwangJoo	경안	나산	1996.01.	236	3	1	59		133.9	182.2	271.2		83.1	110.2	127.1	E	127	15	9	N	37	24	59

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (Jeonse*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
231	GyeongGi	GwangJoo	태전	성원 1 차	1999.07.	654	3	1	60		154.2	212.5	337.5		87.5	120.8	129.2	E	127	13	44	N	37	23	23
232	GyeongGi	GwangJoo	실촌	쌍용 1 차	1998.11.	440	3	1	60	104.2	123.3	175.0	229.2	45.8	69.2	95.8	112.5	E	127	20	17	N	37	20	47
233	GyeongGi	GwangJoo	실촌	LG	1997.01.	222	2	1	58	129.3	103.4	142.2	211.2	60.3	73.3	90.5	112.1	E	127	23	39	N	37	21	57
234	GyeongGi	GwangJoo	오포	쌍용	1999.02.	313	2	1	59		135.6	194.9	245.8		76.3	105.9	118.6	E	127	15	24	N	37	22	50
235	GyeongGi	GwangJoo	탄벌	동보	1996.06.	815	3	1	59	148.3	139.8	194.9	250.0	74.6	89.0	118.6	144.1	E	127	14	55	N	37	24	55
236	GyeongGi	GooRi	교문	대우동양고속	1994.11.	680	3	1	61	176.2	153.3	262.3	385.2	102.5	114.8	147.5	184.4	E	127	8	7	N	37	35	19
237	GyeongGi	GooRi	교문	구리우성	1994.08.	341	3	1	60	181.7	154.2	262.5	358.3	101.7	112.5	154.2	170.8	E	127	8	13	N	37	35	17
238	GyeongGi	GooRi	수택	대림한숲	1995.08.	956	2	1	52	171.2	153.8	250.0	326.9	101.0	110.6	149.0	173.1	E	127	8	20	N	37	35	25
239	GyeongGi	GooRi	수택	쌍용	1996.12.	241	3	1	60	195.8	162.5	250.0	341.7	104.2	108.3	150.0	162.5	E	127	8	23	N	37	35	39
240	GyeongGi	GooRi	인창	삼호	1992.05.	240	2	1	57	131.6	118.4	210.5	219.3	78.9	92.1	127.2	127.2	E	127	8	10	N	37	36	12
241	GyeongGi	GooRi	인창	건영	1993.11.	573	2	1	62	173.4	137.1	221.8	258.1	88.7	92.7	116.9	129.0	E	127	8	12	N	37	36	44
242	GyeongGi	GoonPo	궁내	우륵주공 7 단지	1994.07.	1312	2	1	58	191.4	168.1	258.6	422.4	90.5	131.9	163.8	224.1	E	126	55	34	N	37	21	35
243	GyeongGi	GoonPo	당	두산	1993.01.	248	2	1	55	159.1	140.9	209.1	295.5	81.8	109.1	131.8	168.2	E	126	56	44	N	37	20	52
244	GyeongGi	GoonPo	당	주공 3 단지	1997.10.	830	3	1	60	133.3	166.7	245.8	345.8	54.2	116.7	150.0	195.8	E	126	56	44	N	37	20	42
245	GyeongGi	GoonPo	금정	다산주공 3	1992.06.	829	2	1	58	142.2	151.7	238.8	387.9	86.2	129.3	150.9	215.5	E	126	55	52	N	37	21	4
246	GyeongGi	GimPo	감정	쌍용	1998.07.	586	3	1	60	115.8	129.2	195.8	216.7	54.2	79.2	104.2	100.0	E	126	41	53	N	37	37	30
247	GyeongGi	GimPo	감정	한국	1995.09.	620	3	1	77	139.6	100.6	168.8	194.8	64.9	61.7	87.7	87.7	E	126	42	0	N	37	37	34
248	GyeongGi	GimPo	북변	대우	1995.04.	543	2	1	53	146.2	111.3	184.0	188.7	80.2	75.5	108.5	108.5	E	126	43	23	N	37	37	23
249	GyeongGi	GimPo	풍무	길훈 1 차	1993.01.	219	2	1	60		96.7	141.7	141.7		62.5	79.2	91.7	E	126	43	9	N	37	36	47
250	GyeongGi	NamYangJoo	별내	동부	1996.04.	456	3	1	60	112.5	108.3	145.8	154.2	54.2	69.2	87.5	104.2	E	127	12	47	N	37	41	29
251	GyeongGi	NamYangJoo	오남	한신 1 차	1997.12.	283	3	1	60	104.2	113.3	139.2	120.8	35.8	62.5	75.0	70.8	E	127	12	44	N	37	40	54
252	GyeongGi	NamYangJoo	와부	주공 1 차	1996.04.	910	3	1	58	150.9	137.1	224.1	258.6	73.3	86.2	116.4	129.3	E	127	13	2	N	37	35	11
253	GyeongGi	NamYangJoo	진건	현대	1998.04.	399	3	1	60	120.8	133.3	175.0	164.2	39.2	75.0	104.2	87.5	E	127	10	56	N	37	39	27
254	GyeongGi	NamYangJoo	진접	대명	1995.09.	405	3	1	60		100.0	141.7	141.7		66.7	87.5	87.5	E	127	9	40	N	37	42	11
255	GyeongGi	NamYangJoo	퇴계원	극동	1999.03.	498	3	1	60		145.8	208.3	233.3		87.5	120.8	116.7	E	127	8	19	N	37	38	55
256	GyeongGi	NamYangJoo	화도	삼신	1995.01.	345	3	1	60		100.8	137.5	150.0		58.3	79.2	93.3	E	127	19	27	N	37	38	59
257	GyeongGi	NamYangJoo	화도	마석건영	1997.01.	213	3	1	60		77.5	119.2	123.3		50.0	66.7	66.7	E	127	18	9	N	37	39	29
258	GyeongGi	DongDooCheon	지행	현대 1 차	1997.07.	227	3	1	60		125.0	129.2	125.0		52.5	69.2	59.2	E	127	3	34	N	37	53	38
259	GyeongGi	DongDooCheon	생연	우성	1992.12.	163	2	1	60		91.7	73.3	71.7		43.3	45.0	39.5	E	127	3	46	N	37	54	31
260	GyeongGi	DongDooCheon	생연	건영	1995.11.	397	2	1	59		89.0	87.3	73.7		46.6	53.4	40.7	E	127	2	37	N	37	53	44
261	GyeongGi	BooCheon	괴안	삼익	1989.08.	682	2	1	57	140.4	122.8	179.8	250.0	90.4	96.5	114.0	122.8	E	126	48	11	N	37	28	38
262	GyeongGi	BooCheon	괴안	삼익세라믹	1988.12.	781	2	1	57	135.1	127.2	180.7	241.2	83.3	92.1	122.8	122.8	E	126	48	7	N	37	28	32
263	GyeongGi	BooCheon	상	반달삼익	1993.04.	828	3	1	62		165.3	262.1	350.8		116.9	149.2	185.5	E	126	45	32	N	37	29	46
264	GyeongGi	BooCheon	상	한아름현대	1994.06.	824	3	1	59	182.2	152.5	224.6	271.2	97.5	123.7	148.3	161.0	E	126	44	55	N	37	29	41
265	GyeongGi	BooCheon	소사	한신	1988.10.	916	2	1	64	128.1	117.2	175.8	273.4	75.8	82.0	109.4	105.5	E	126	48	2	N	37	28	26
266	GyeongGi	BooCheon	소사	주공	1994.03.	1210	3	1	58	145.7	137.9	204.3	280.2	73.3	99.1	125.0	133.6	E	126	48	8	N	37	28	5
267	GyeongGi	BooCheon	송내	뉴서울	1995.10.	971	3	1	60	170.8	154.2	241.7	270.8	95.8	120.8	154.2	175.0	E	126	45	45	N	37	29	9
268	GyeongGi	BooCheon	송내	현대 2 차	1990.02.	372	2	1	52	135.6	134.6	177.9	200.0	89.4	105.8	129.8	134.6	E	126	45	39	N	37	28	59
269	GyeongGi	BooCheon	송내	건우 1 차	1987.11.	120	3	1	58	107.8	107.8	202.6	248.3	56.0	64.7	107.8	106.9	E	126	45	35	N	37	29	11
270	GyeongGi	BooCheon	심곡	극동	1980.04.	495	2	1	70	100.0	102.1	153.6	200.0	59.3	75.0	96.4	92.9	E	126	46	52	N	37	28	36
271	GyeongGi	BooCheon	심곡	태경삼익	1985.05.	128	2	1	53	129.2	113.2	174.5	207.5	78.3	84.9	127.4	113.2	E	126	46	52	N	37	28	40
272	GyeongGi	BooCheon	역곡	한국	1996.08.	497	3	1	60	162.5	150.0	220.8	216.7	95.8	104.2	137.5	141.7	E	126	48	49	N	37	29	35
273	GyeongGi	BooCheon	원미	풍림	1999.01.	808	2	1	60		166.7	220.8	258.3		112.5	137.5	141.7	E	126	47	29	N	37	29	29
274	GyeongGi	BooCheon	원종	신동문	1998.07.	216	2	1	60		140.8	204.2	225.0		87.5	112.5	120.8	E	126	47	53	N	37	31	45
275	GyeongGi	BooCheon	중	그린타운우성 2 차	1994.12.	340	3	1	59	200.8	182.2	334.7	406.8	105.9	122.9	178.0	194.9	E	126	46	11	N	37	29	51
276	GyeongGi	BooCheon	중	연화건영	1994.04.	424	2	1	54	162.0	157.4	222.2	287.0	97.2	115.7	138.9	162.0	E	126	46	48	N	37	29	56
277	GyeongGi	BooCheon	중	보람아주	1995.05.	1398	3	1	60	183.3	179.2	325.0	391.7	79.2	120.8	162.5	179.2	E	126	45	30	N	37	29	55
278	GyeongGi	BooCheon	중	미리내동성	1993.02.	970	2	1	53	165.1	165.1	268.9	339.6	99.1	127.4	155.7	179.2	E	126	46	8	N	37	29	57
279	GyeongGi	BooCheon	중	꿈삼환	1994.07.	348	3	1	59	175.4	165.3	266.9	389.8	99.2	122.9	148.3	169.5	E	126	46	46	N	37	30	3
280	GyeongGi	SeongNam	구미	까치대우	1995.12.	976	2	1	51	235.3	235.3	397.1	509.8	112.7	161.8	220.6	250.0	E	127	7	2	N	37	21	0
281	GyeongGi	SeongNam	금곡	청솔한라	1995.12.	768	3	1	59	241.5	228.8	457.6	593.2	101.7	156.8	211.9	245.8	E	127	6	24	N	37	21	21
282	GyeongGi	SeongNam	이매동	아름두산	1992.08.	566	3	1	59	228.8	228.8	508.5	610.2	121.2	156.8	224.6	245.8	E	127	7	11	N	37	24	0
283	GyeongGi	SeongNam	분당	샛별동성	1992.06.	582	3	1	59	207.6	211.9	423.7	533.9	105.9	148.3	211.9	237.3	E	127	7	55	N	37	22	20
284	GyeongGi	SeongNam	서현	효자동아	1992.07.	648	3	1	59	228.8	228.8	466.1	593.2	110.2	144.1	228.8	237.3	E	127	8	7	N	37	22	39
285	GyeongGi	SeongNam	서현	효자화성	1994.09.	564	2	1	54	231.5	203.7	388.9	518.5	115.7	143.5	203.7	268.5	E	127	8	10	N	37	22	20
286	GyeongGi	SeongNam	성남	현대	1991.07.	375	2	1	55	159.1	140.9	236.4	286.4	95.5	100.0	127.3	140.9	E	127	8	25	N	37	25	45
287	GyeongGi	SeongNam	수내	푸른신성	1992.06.	642	3	1	60	225.0	225.0	416.7	616.7	120.8	158.3	220.8	266.7	E	127	7	37	N	37	22	6
288	GyeongGi	SeongNam	수진	현대	1994.10.	107	3	1	60		150.0	225.0	375.0		104.2	150.0	191.7	E	127	7	54	N	37	26	23
289	GyeongGi	SeongNam	신흥	두산	1993.02.	570	3	1	60	175.0	175.0	325.0	533.3	95.8	120.8	175.0	175.0	E	127	8	58	N	37	26	42
290	GyeongGi	SeongNam	신흥	청구	1993.05.	493	3	1	63	198.4	202.4	317.5	515.9	95.2	123.0	182.5	182.5	E	127	9	4	N	37	26	38

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (Jeonse*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
291	GyeongGi	SeongNam	야탑	장미동부	1993.02.	1134	3	1	60	233.3	233.3	508.3	633.3	120.8	150.0	225.0	270.8	E	127	7	39	N	37	24	55
292	GyeongGi	SeongNam	수내	양지금호	1993.02.	1490	2	1	60	241.7	216.7	441.7	625.0	129.2	154.2	225.0	266.7	E	127	7	2	N	37	22	25
293	GyeongGi	SeongNam	하대원	현대	1995.04.	314	3	1	60	187.5	166.7	279.2	354.2	104.2	116.7	158.3	170.8	E	127	9	5	N	37	25	57
294	GyeongGi	SeongNam	야탑	탑선경	1992.08.	976	2	1	52	221.2	221.2	413.5	528.8	120.2	158.7	235.6	250.0	E	127	7	15	N	37	24	27
295	SooWon	GwonSeon	당수	삼정	1997.02.	898	3	1	60		106.7	168.3	204.2		70.8	100.0	131.7	E	126	56	34	N	37	17	23
296	SooWon	GwonSeon	구운	삼환 1 차	1991.04.	780	2	1	55	96.4	95.5	177.3	218.2	40.9	75.5	100.0	127.3	E	126	58	42	N	37	17	2
297	SooWon	GwonSeon	권선	삼천리 1 차	1994.05.	496	2	1	61	145.1	118.9	204.9	217.2	90.2	102.5	135.2	147.5	E	127	1	26	N	37	15	7
298	SooWon	GwonSeon	권선	현대	1996.04.	809	3	1	60	150.0	125.0	237.5	258.3	79.2	95.8	137.5	170.8	E	127	2	12	N	37	15	11
299	SooWon	GwonSeon	금곡	삼익 1 차	1995.05.	400	3	1	59		105.9	153.4	203.4		80.5	101.7	110.2	E	126	57	16	N	37	16	16
300	SooWon	YoungTong	매탄	우성	1997.01.	230	2	1	59	114.4	122.9	182.2	173.7	72.0	93.2	122.9	118.6	E	127	2	17	N	37	16	24
301	SooWon	YoungTong	매탄	삼성 2 차	1989.07.	624	2	1	55	131.8	105.5	188.2	231.8	77.3	90.9	127.3	145.5	E	127	2	36	N	37	16	9
302	SooWon	YoungTong	매탄	현대	1988.01.	690	3	1	71	140.8	116.2	218.3	320.4	88.0	88.0	123.2	154.9	E	127	2	34	N	37	16	5
303	SooWon	GwonSeon	세류	삼익	1999.01.	344	3	1	60		120.8	183.3	225.0		79.2	133.3	141.7	E	127	1	2	N	37	15	40
304	SooWon	GwonSeon	세류	성원	1996.04.	366	2	1	59	97.5	127.1	211.9	228.8	63.6	80.5	131.4	127.1	E	127	0	56	N	37	15	48
305	SooWon	YoungTong	영통	황골쌍용	1998.03.	872	2	1	59	155.1	178.0	288.1	355.9	55.1	121.2	148.3	178.0	E	127	5	1	N	37	15	48
306	SooWon	JangAn	영화	태영	1992.11.	117	3	1	59		101.7	161.0	161.0		89.0	110.2	118.6	E	127	0	27	N	37	17	19
307	SooWon	PalDal	우만	선경	1995.10.	372	2	1	60	155.8	139.2	197.5	225.0	95.8	112.5	137.5	145.8	E	127	2	11	N	37	16	30
308	SooWon	JangAn	율전	삼성 2 단지	1998.08.	700	3	1	59		165.3	266.9	317.8		114.4	156.8	211.9	E	126	58	8	N	37	17	39
309	SooWon	PalDal	인계	선경 1 차	1993.06.	360	2	1	59	161.0	144.1	199.2	237.3	84.7	101.7	131.4	156.8	E	127	2	11	N	37	16	34
310	SooWon	JangAn	정자	동신	1987.03.	1548	2	1	57	92.1	96.5	161.4	232.5	59.6	84.2	109.6	107.0	E	126	59	38	N	37	18	13
311	SooWon	JangAn	조원	벽산	1989.07.	740	2	1	55		90.0	155.5	200.0		72.7	104.5	131.8	E	127	1	16	N	37	17	51
312	SooWon	JangAn	파장	현대	1992.04.	225	3	1	60		123.3	166.7	275.0		87.5	104.2	150.0	E	127	0	2	N	37	18	28
313	SooWon	GwonSeon	호매실	삼익 2 차	1998.06.	354	3	1	60		104.2	150.8	204.2		79.2	100.0	112.5	E	126	57	26	N	37	16	8
314	GyeongGi	SiHeung	거모	아주 4 차	1993.01.	299	3	1	60		82.5	116.7	118.3		52.5	69.2	70.8	E	126	46	58	N	37	20	42
315	GyeongGi	SiHeung	대야	극동	2000.07.	350	3	1	60		150.0	212.5	229.2		87.5	125.0	133.3	E	126	47	13	N	37	26	55
316	GyeongGi	SiHeung	대야	우남한신	1997.02.	350	3	1	60		121.7	162.5	195.8		85.8	112.5	115.8	E	126	47	38	N	37	27	0
317	GyeongGi	SiHeung	도창	에이스	1997.01.	798	3	1	59		104.2	136.4	186.4		72.0	76.3	101.7	E	126	49	0	N	37	24	35
318	GyeongGi	SiHeung	신천	우남한신	1997.01.	186	3	1	60		125.8	158.3	204.2		70.8	87.5	119.2	E	126	47	17	N	37	25	55
319	GyeongGi	SiHeung	은행	대우 3 차	1998.10.	1272	3	1	60	133.3	150.0	225.0	278.3	55.8	104.2	137.5	141.7	E	126	47	48	N	37	26	33
320	GyeongGi	SiHeung	정왕	미주	1996.11.	492	3	1	59		116.1	151.7	199.2		75.4	97.5	122.9	E	126	43	43	N	37	21	33
321	GyeongGi	SiHeung	정왕	신동아	1996.10.	790	3	1	60	110.0	107.5	135.8	169.2	45.8	73.3	87.5	112.5	E	126	43	15	N	37	21	30
322	GyeongGi	SiHeung	정왕	한신	1996.03.	406	3	1	60		120.8	152.5	166.7		77.5	100.0	125.0	E	126	43	57	N	37	21	18
323	GyeongGi	SiHeung	정왕	한일	1996.07.	580	3	1	60	112.5	109.2	143.3	191.7	45.8	73.3	95.8	125.0	E	126	43	26	N	37	21	29
324	GyeongGi	SiHeung	정왕	건영 1 차	1997.08.	620	3	1	60		106.7	137.5	158.3		72.5	95.8	108.3	E	126	44	43	N	37	20	23
325	GyeongGi	AnSan	본오	신안	1993.07.	2132	2	1	62	133.9	110.5	164.5	229.8	81.5	85.5	118.5	123.4	E	126	51	54	N	37	17	42
326	GyeongGi	AnSan	본오	한양고층	1990.12.	2300	3	1	71	128.9	109.2	169.0	218.3	79.6	84.5	114.1	109.2	E	126	51	42	N	37	17	42
327	GyeongGi	AnSan	사	선경	1994.07.	550	2	1	55	140.9	131.8	195.5	236.4	86.4	90.9	118.2	142.7	E	126	51	1	N	37	17	30
328	GyeongGi	AnSan	사	현대 2 차	1995.02.	520	3	1	60	125.0	125.8	191.7	233.3	64.2	87.5	112.5	141.7	E	126	51	17	N	37	17	29
329	GyeongGi	AnSan	선부	수정한양	1992.10.	1870	3	1	70	132.1	117.9	178.6	240.7	75.0	82.1	110.7	103.6	E	126	48	55	N	37	20	21
330	GyeongGi	AnSan	성포	선경	1990.12.	1768	2	1	62	114.5	114.5	153.2	208.1	68.5	84.7	103.2	108.9	E	126	50	34	N	37	19	32
331	GyeongGi	AnSan	월피	한양 1 차	1990.03.	1362	2	1	58	107.8	107.8	140.5	198.3	64.7	75.0	90.5	125.0	E	126	50	54	N	37	19	56
332	GyeongGi	AnSeong	금산	주은청설	1999.10.	457	3	1	60		106.7	135.8	141.7	0.0	58.3	79.2	83.3	E	127	16	2	N	37	0	52
333	GyeongGi	AnSeong	봉산	한주	1994.01.	395	3	1	60	91.7	90.0	68.3	116.7	50.0	50.0	44.2	75.0	E	127	16	41	N	37	0	36
334	GyeongGi	AnSeong	당왕	대우경남	1997.04.	984	3	1	59		110.2	133.9	140.7		55.1	80.5	84.7	E	127	15	35	N	37	0	54
335	GyeongGi	AnSeong	숭인	동신	1995.10.	496	2	1	60		92.5	125.0	137.5		50.0	70.8	82.5	E	127	16	31	N	37	0	43
336	GyeongGi	AnSeong	당왕	대우 1 차	1993.11.	762	3	1	70	96.4	110.7	127.1	135.7	50.0	57.1	71.4	85.7	E	127	15	19	N	37	0	52
337	GyeongGi	AnYang	석수	럭키	1987.06.	735	2	1	59	146.6	131.4	228.8	305.1	87.3	104.2	131.4	165.3	E	126	54	28	N	37	24	34
338	GyeongGi	AnYang	관양	공작 LG	1994.03.	766	2	1	50	200.0	180.0	252.0	390.0	123.0	142.0	160.0	200.0	E	126	57	27	N	37	24	2
339	GyeongGi	AnYang	안양	성원 1 차	1995.11.	934	3	1	60	175.0	154.2	237.5	250.0	101.7	112.5	137.5	145.8	E	126	54	52	N	37	23	40
340	GyeongGi	AnYang	박달	금호	1996.10.	752	2	1	59	169.5	139.8	237.3	296.6	89.0	97.5	127.1	135.6	E	126	54	5	N	37	23	56
341	GyeongGi	AnYang	관양	한가람삼성	1995.03.	708	3	1	60	204.2	208.3	300.0	491.7	112.5	141.7	195.8	230.0	E	126	57	20	N	37	23	59
342	GyeongGi	AnYang	비산	관악부영 4 차	1993.10.	796	3	1	60	208.3	191.7	287.5	466.7	120.8	137.5	175.0	216.7	E	126	56	42	N	37	23	47
343	GyeongGi	AnYang	비산	성원	1995.12.	282	3	1	59	178.0	148.3	194.9	322.0	84.7	97.5	114.4	152.5	E	126	57	9	N	37	24	24
344	GyeongGi	AnYang	호계	삼익	1996.10.	262	2	1	60	154.2	131.7	166.7	229.2	87.5	98.3	108.3	145.8	E	126	57	31	N	37	21	57
345	GyeongGi	YangJoo	덕계	신우	1994.12.	135	3	1	60		100.0	108.3	120.8		58.3	66.7	66.7	E	127	2	47	N	37	48	59
346	GyeongGi	YangJoo	덕정	융보	1992.11.	195	3	1	59		67.8	80.5	72.0		46.6	46.6	38.1	E	127	3	47	N	37	50	11
347	GyeongGi	YangJoo	백석	세아 1 차	1993.09.	282	3	1	58		69.0	81.9	73.3		47.4	47.4	38.8	E	126	59	26	N	37	47	48
348	GyeongGi	YangJoo	광사	신도	1999.09.	400	3	1	60		107.5	125.0	125.0		63.3	70.8	52.5	E	127	4	27	N	37	47	34
349	GyeongGi	YangPyung	양서	훼미리	1992	115	2	1	65		103.8	107.7	106.2		42.3	52.3	51.5	E	127	19	6	N	37	32	45
350	GyeongGi	OSan	갈곶	우방	1999.04.	386	3	1	59		105.9	178.0	168.6		72.0	105.9	102.5	E	127	4	7	N	37	8	1

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (Jeonse*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
351	GyeongGi	OSan	수청	대우	1994.01.	1144	2	1	54		88.0	162.0	144.4		60.2	88.0	88.0	E	127	3	45	N	37	9	54
352	GyeongGi	OSan	서	신동아 2 차	1999.11.	844	3	1	60		100.0	162.5	154.2		51.7	95.8	87.5	E	127	2	45	N	37	8	35
353	GyeongGi	OSan	서	신동아 1 차	1995.08.	498	2	1	60		83.3	119.2	120.8		45.0	68.3	70.8	E	127	2	33	N	37	8	39
354	GyeongGi	OSan	수청	삼익	1992.11.	220	2	1	54			180.6	143.5			83.3	88.0	E	127	4	9	N	37	9	55
355	GyeongGi	YongIn	영덕	두진	1996.10.	541	3	1	60	145.8	125.0	225.0	258.3	70.8	95.8	154.2	129.2	E	127	5	48	N	37	16	2
356	GyeongGi	YongIn	신갈	신갈삼익	1996.12.	296	3	1	60	154.2	131.7	191.7	291.7	70.8	95.8	112.5	129.2	E	127	6	22	N	37	16	41
357	GyeongGi	YongIn	김량장	현대	1995.12.	755	3	1	60	120.8	120.8	175.0	200.0	70.8	87.5	112.5	120.8	E	127	12	41	N	37	13	44
358	GyeongGi	YongIn	마평	라이프	1994.06.	350	3	1	58	116.4	99.1	112.1	129.3	73.3	69.0	77.6	64.7	E	127	12	55	N	37	13	54
359	GyeongGi	YongIn	풍덕천	한국	1995.05.	416	3	1	62	181.5	173.4	254.0	423.4	88.7	108.9	133.1	165.3	E	127	5	37	N	37	19	24
360	GyeongGi	YongIn	풍덕천	현대	1994.12.	1168	3	1	60	183.3	154.2	229.2	366.7	95.8	104.2	112.5	162.5	E	127	5	40	N	37	19	34
361	GyeongGi	YongIn	죽전	죽전벽산 1 단지	1997.08.	612	3	1	60	220.8	200.0	325.0	445.8	104.2	129.2	183.3	208.3	E	127	6	20	N	37	20	9
362	GyeongGi	YongIn	유방	인정프린스 2 차	1995.06.	330	3	1	59	120.3	104.2	131.4	197.5	65.3	70.3	82.2	97.5	E	127	12	51	N	37	15	40
363	GyeongGi	EuiWang	삼	운양까치	1991.01.	178	2	1	62	108.9	100.8	121.0	233.9	67.7	68.5	84.7	112.9	E	126	57	19	N	37	19	5
364	GyeongGi	EuiWang	오전	무궁화선경	1995.01.	330	2	1	53	155.7	135.8	179.2	287.7	83.0	99.1	117.9	150.9	E	126	58	44	N	37	21	4
365	GyeongGi	EuiWang	오전	진달래	1998.05.	565	3	1	60	141.7	154.2	220.8	291.7	55.8	116.7	150.0	187.5	E	126	57	58	N	37	22	0
366	GyeongGi	EuiWang	포일	동부	1997.12.	269	2	1	60	150.0	175.0	245.8	313.3	83.3	154.2	175.0	191.7	E	126	58	52	N	37	23	31
367	GyeongGi	EuiJeongBoo	금오	거성	1998.05.	531	3	1	60	120.8	120.8	137.5	141.7	54.2	70.8	95.8	104.2	E	127	4	31	N	37	45	29
368	GyeongGi	EuiJeongBoo	녹양	동원 1 차	1995.07.	406	2	1	60	110.8	95.8	124.2	137.5	65.8	70.8	87.5	70.8	E	127	2	16	N	37	45	22
369	GyeongGi	EuiJeongBoo	신곡	효자벽산	1994.04.	297	3	1	71	139.4	116.2	133.8	147.9	78.9	73.9	98.6	105.6	E	127	3	41	N	37	44	27
370	GyeongGi	EuiJeongBoo	용현	동문	1991.08.	160	2	1	61	99.2	84.4	114.8	121.3	60.7	57.4	69.7	59.0	E	127	5	8	N	37	43	51
371	GyeongGi	EuiJeongBoo	장암	동아	1997.06.	1488	3	1	60	166.7	145.0	179.2	208.3	87.5	95.8	116.7	116.7	E	127	3	15	N	37	43	30
372	GyeongGi	EuiJeongBoo	호원	건영	1993.03.	900	2	1	60	144.2	120.8	175.0	183.3	79.2	85.8	104.2	116.7	E	127	3	0	N	37	42	22
373	GyeongGi	ECheon	갈산	우성	1996.01.	298	3	1	60	110.0	104.2	112.5	133.3	54.2	70.8	84.2	91.7	E	127	27	51	N	37	17	26
374	GyeongGi	ECheon	부발	삼익	1998.01.	493	3	1	60	99.2	104.2	129.2	161.7	43.3	70.8	91.7	116.7	E	127	28	38	N	37	15	32
375	GyeongGi	ECheon	장호원	동양	1992	154	3	1	59			84.7	86.4			46.6	50.0	E	127	36	57	N	37	6	51
376	GyeongGi	ECheon	증포	선경	1997.01.	238	3	1	59		104.2	135.6	161.0		70.3	84.7	108.5	E	127	27	12	N	37	17	34
377	GyeongGi	PaJoo	검산	성원	2000.04.	656	3	1	60		120.8	162.5	179.2		65.0	91.7	87.5	E	126	45	37	N	37	46	18
378	GyeongGi	PaJoo	금능	흰돌마을장안 6 차	1999.10.	498	3	1	59		135.6	161.0	237.3		67.8	105.9	122.9	E	126	47	1	N	37	45	19
379	GyeongGi	PaJoo	금촌	동문 1 차	1993.01.	244	3	1	60		104.2	125.0	125.0		51.7	70.0	70.8	E	126	46	17	N	37	46	18
380	GyeongGi	PaJoo	조리	동문 1 차	1996.11.	118	3	1	59	110.2	114.4	119.5	139.8	55.1	63.6	80.5	80.5	E	126	48	28	N	37	44	30
381	GyeongGi	PyungTaek	독곡	삼익 2 차	1994.01.	364	2	1	66		79.5	125.0	115.9	0.0	47.7	81.1	72.0	E	127	3	49	N	37	5	6
382	GyeongGi	PyungTaek	동삭	현대동삭	1992.09	612	3	1	63	88.1	71.4	107.1	99.2	50.0	38.9	51.6	63.5	E	127	5	54	N	37	1	8
383	GyeongGi	PyungTaek	비전	벽산늘푸른	1994.06.	368	3	1	60	120.8	111.7	166.7	158.3	72.5	72.5	112.5	120.8	E	127	7	11	N	36	59	30
384	GyeongGi	PyungTaek	비전	동아백합	1994.01.	148	2	1	60		91.7	112.5	119.2		66.7	79.2	104.2	E	127	6	34	N	36	59	27
385	GyeongGi	PyungTaek	세교	우성꿈그린	1995.11.	580	3	1	63	107.1	103.2	166.7	156.3	67.5	67.5	99.2	115.1	E	127	4	48	N	37	0	7
386	GyeongGi	PyungTaek	안중	동환	1995.01.	150	2	1	60			100.0	102.5			62.5	62.5	E	126	55	16	N	36	59	11
387	GyeongGi	PyungTaek	통복	동아국화	1994.05.	218	3	1	58		94.8	118.1	119.0		64.7	73.3	77.6	E	127	5	18	N	37	0	5
388	GyeongGi	PoCheon	소흘	일신건영	1993.04.	176	2	1	60		85.8	98.3	95.8		58.3	66.7	54.2	E	127	8	30	N	37	49	32
389	GyeongGi	PoCheon	소흘	우정 1 차	1997.01.	908	3	1	60		95.0	113.3	104.2		54.2	70.8	62.5	E	127	8	19	N	37	49	33
390	GyeongGi	HaNam	덕풍	현대	1995.11.	555	3	1	60		162.5	262.5	283.3		112.5	158.3	150.0	E	127	12	2	N	37	31	58
391	GyeongGi	HaNam	덕풍	서해	1996.04.	423	2	1	59		182.2	275.4	322.0		127.1	156.8	156.8	E	127	11	50	N	37	32	35
392	GyeongGi	HaNam	신장	동일	1999.09.	438	3	1	60		200.0	312.5	400.0		129.2	187.5	179.2	E	127	13	11	N	37	32	28
393	GyeongGi	HaNam	창우	부영	1994.12.	2055	2	1	49	186.7	171.4	290.8	316.3	102.0	117.3	171.4	163.3	E	127	13	32	N	37	32	27

* see footnote 94

Table 38 Sample 3 bedroom apartment data of Seoul

No.	Address	Apt. Complex	Built	House-	Bed-	Bath-	Floor	Price (10 US $/m²)	Rent (JeonSe*) (10 US $/m²)	Longitude	Latitude

					year	holds	room	room	area	1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
1	Seoul	GangNam	대치	우성 2 차	1989.12.	354	3	2	84.81	367.9	400.9	713.4	1120.2	182.8	247.6	294.8	365.5	E	127	3	55	N	37	30	3
2	Seoul	GangNam	대치	쌍용 2 차	1983.11	364	3	2	84.48	331.4	331.4	828.6	1396.8	150.3	189.4	284.1	384.7	E	127	4	15	N	37	29	53
3	Seoul	GangNam	도곡	도곡현대	1992.12.	211	3	2	84.81	277.1	300.7	595.4	707.5	143.9	182.8	224.0	247.6	E	127	2	20	N	37	29	21
4	Seoul	GangNam	삼성	청구	1992.02.	167	3	2	84.81	341.9	330.1	607.2	913.8	165.1	182.8	283.0	324.3	E	127	3	29	N	37	31	11
5	Seoul	GangNam	수서	삼익	1992.12.	650	3	2	84.15	314.9	285.2	683.3	820.0	148.5	172.3	237.7	285.2	E	127	6	2	N	37	29	20
6	Seoul	GangNam	압구정	미성 2 차	1988.07.	911	3	2	83.16	294.6	288.6	631.3	1004.1	156.3	168.4	240.5	282.6	E	127	1	10	N	37	31	24
7	Seoul	GangNam	일원	푸른마을	1994.02.	930	3	2	84.48	396.5	390.6	710.2	1041.7	171.6	219.0	307.8	355.1	E	127	4	51	N	37	29	1
8	Seoul	GangNam	일원	현대 4 차	1987.02.	142	3	2	84.81	338.4	306.6	825.4	1179.1	159.2	182.8	283.0	336.0	E	127	4	39	N	37	29	27
9	Seoul	GangNam	일원	한솔	1993.12.	570	3	2	82.5	375.8	430.3	781.8	1278.8	175.8	236.4	303.0	363.6	E	127	4	36	N	37	28	54
10	Seoul	GangNam	도곡	역삼럭키	1993.11.	1094	3	2	85	329.4	305.9	641.2	982.4	152.9	194.1	276.5	329.4	E	127	2	24	N	37	29	26
11	Seoul	GangNam	청담	현대 2 차	1988.05.	214	3	2	84.81	318.4	324.3	601.3	913.8	159.2	159.2	294.8	330.1	E	127	2	26	N	37	31	16
12	Seoul	GangDong	길	길동우성	1994.10.	811	3	2	84.81	247.6	229.9	347.8	424.5	114.4	135.6	188.7	200.4	E	127	8	38	N	37	32	13
13	Seoul	GangDong	둔촌	중앙하이츠	1995.12.	232	3	2	84.48	248.6	207.1	337.4	384.7	130.2	136.1	189.4	195.3	E	127	8	32	N	37	31	46
14	Seoul	GangDong	명일	명일 LG	1996.12	772	3	2	84.81	277.1	259.4	459.9	536.5	120.3	149.7	212.2	224.0	E	127	8	44	N	37	32	56
15	Seoul	GangDong	상일	중앙하이츠	1992.05.	410	3	2	83.82	229.1	196.9	387.7	590.6	109.8	125.3	167.0	190.9	E	127	9	35	N	37	33	2
16	Seoul	GangDong	성내	현대	1987.11.	277	3	2	84.15	219.8	202.0	368.4	451.6	103.4	112.9	178.3	190.1	E	127	7	34	N	37	32	6
17	Seoul	GangDong	천호	한신	1990.03.	224	3	2	81.84	189.4	185.7	268.8	354.3	95.3	106.3	134.4	158.8	E	127	8	5	N	37	32	44
18	Seoul	GangBook	미아	현대	1992.12.	231	3	2	84.48		195.3	272.3	343.3		114.8	153.9	153.9	E	127	1	33	N	37	37	50
19	Seoul	GangBook	번	한양	1991.03.	261	3	2	84.48	184.7	145.6	197.7	230.8	94.7	97.1	130.2	112.5	E	127	2	27	N	37	37	36
20	Seoul	GangBook	번	주공 4 단지	1991.04.	900	3	2	84.48	195.3	168.1	242.7	295.9	97.1	103.0	118.4	148.0	E	127	2	23	N	37	37	51
21	Seoul	GangBook	수유	수유벽산	1992.10.	1454	3	2	85.8	206.3	177.2	244.8	320.5	107.2	104.9	139.9	151.5	E	127	1	8	N	37	38	35
22	Seoul	GangBook	수유	극동	1990.10.	574	3	2	84.81	188.7	165.1	220.5	259.4	96.7	100.2	123.8	141.5	E	127	0	43	N	37	38	30
23	Seoul	GangBook	우이	성원	1990.09.	262	3	2	84.81	162.7	147.4	185.1	229.9	90.8	96.7	106.1	112.0	E	127	0	49	N	37	39	42
24	Seoul	GangSeo	가양	우성	1990.10.	414	3	2	84.48	215.4	195.3	295.9	503.1	97.1	118.4	118.4	153.9	E	126	51	15	N	37	33	43
25	Seoul	GangSeo	등촌	현대 1 차	1995.05.	170	3	2	84.15	222.2	202.0	293.5	386.2	118.8	127.2	142.6	184.2	E	126	51	19	N	37	33	21
26	Seoul	GangSeo	등촌	대림	1995.07.	680	3	2	89.76	311.9	258.5	412.2	612.7	124.8	158.2	178.3	211.7	E	126	50	47	N	37	33	44
27	Seoul	GangSeo	마곡	신안	1993.12.	253	3	2	84.81	185.1	149.7	259.4	436.3	79.0	79.0	106.1	123.8	E	126	49	26	N	37	34	4
28	Seoul	GangSeo	방화	동성	1993.12.	686	3	2	84.48	254.5	242.7	333.8	526.8	114.8	148.0	165.7	201.2	E	126	48	44	N	37	34	46
29	Seoul	GangSeo	염창	삼성하나로	1994.02.	178	3	2	84.48		183.5	266.3	384.7		117.2	148.0	171.6	E	126	52	19	N	37	33	5
30	Seoul	GangSeo	화곡	대림	1992.08.	416	3	2	84.81	224.0	196.9	271.2	389.1	117.9	123.8	153.3	188.7	E	126	50	13	N	37	31	59
31	Seoul	GwanAk	봉천	관악현대	1991.11.	2134	3	2	84.48	224.9	207.1	290.0	556.3	120.7	120.7	165.7	201.2	E	126	57	36	N	37	29	33
32	Seoul	GwanAk	봉천	낙성현대 1 차	1988.05.	251	3	2	84.81	224.0	214.6	294.8	389.1	100.2	106.1	176.9	218.1	E	126	57	56	N	37	28	22
33	Seoul	GwanAk	신림	신림현대	1993.05.	1634	3	2	82.5	244.8	218.2	284.8	412.1	127.3	127.3	163.6	181.8	E	126	55	57	N	37	28	30
34	Seoul	GwanAk	신림	신동아	1992.10.	107	3	2	84.15	190.1	175.9	213.9	228.8	101.0	101.0	130.7	142.6	E	126	56	26	N	37	27	51
35	Seoul	GwanAk	신림	건영 3 차	1991.10.	783	3	2	84.48	227.3	201.2	290.0	346.2	112.5	124.3	165.7	183.5	E	126	57	6	N	37	28	37
36	Seoul	GwanAk	신림	동부	1994.12.	592	3	2	84.48	278.2	248.6	351.6	420.2	142.0	148.0	195.3	219.0	E	126	55	45	N	37	28	50
37	Seoul	GwanAk	신림	건영 4 차	1995.10.	236	3	2	84.48	224.9	213.1	272.3	295.9	114.8	124.3	153.9	183.5	E	126	55	59	N	37	28	49
38	Seoul	GwanAk	신림	미성	1982.12.	280	3	2	91.08	159.2	170.2	263.5	373.3	90.0	106.5	120.8	148.2	E	126	54	12	N	37	28	56
39	Seoul	GwangJin	광장	현대 8 단지	1994.09.	537	3	2	84.48	290.0	295.9	497.2	591.9	136.1	148.0	224.9	290.0	E	127	5	56	N	37	32	30
40	Seoul	GwangJin	광장	삼성 2 차	1988.11.	195	3	2	84.48	254.5	230.8	449.8	769.4	126.7	142.0	201.2	278.2	E	127	6	7	N	37	32	32
41	Seoul	GwangJin	군자	일성파크	1996.01.	357	3	2	84.81		206.3	330.1	389.1		123.8	176.9	182.8	E	127	4	21	N	37	33	4
42	Seoul	GwangJin	노유	극동	1990.11.	158	3	2	84.15	213.9	196.1	362.4	522.9	101.0	118.8	178.3	202.0	E	127	3	52	N	37	32	1
43	Seoul	GwangJin	자양	현대 2 차	1993.05.	184	3	2	84.15	255.5	231.7	356.5	564.5	130.7	142.6	166.4	213.9	E	127	4	56	N	37	31	41
44	Seoul	GwangJin	자양	한라	1996.02.	329	3	2	84.15	249.6	210.3	374.3	522.9	124.8	136.7	178.3	210.9	E	127	4	12	N	37	32	7
45	Seoul	GooRo	개봉	삼환	1995.11.	783	3	2	84.48	207.1	177.6	242.7	248.6	100.6	103.0	130.2	142.0	E	126	51	16	N	37	29	40
46	Seoul	GooRo	고척	센츄리	1994.05.	391	3	2	84.15		162.8	234.1	320.9		97.4	118.8	124.8	E	126	51	44	N	37	30	15
47	Seoul	GooRo	구로	럭키	1993.03.	427	3	2	84.48	221.4	201.2	286.5	349.2	106.5	120.7	159.8	177.6	E	126	53	38	N	37	29	31
48	Seoul	GooRo	구로	한국현대	1993.10.	115	3	2	84.48	156.3	142.0	185.8	278.2	94.7	106.5	100.6	159.8	E	126	52	31	N	37	29	52
49	Seoul	GooRo	신도림	우성 1 차	1994.12.	169	3	2	84.81	188.7	176.9	253.5	436.3	84.9	102.6	141.5	165.1	E	126	53	9	N	37	30	41
50	Seoul	GooRo	오류	동부	1996.08.	252	3	2	84.48		165.7	219.0	266.3	0.0	103.0	130.2	133.2	E	126	50	52	N	37	29	49
51	Seoul	GeumCheon	가산	두산	1997.12.	1495	3	2	84.81	185.7	196.9	285.3	377.3	64.9	114.4	141.5	176.9	E	126	53	33	N	37	28	28
52	Seoul	GeumCheon	독산	한신	1990.12.	1000	3	2	89.463	190.0	162.1	307.4	363.3	91.7	106.2	134.1	162.1	E	126	53	22	N	37	27	19
53	Seoul	GeumCheon	독산	독산현대	1997.03.	204	3	2	83.82	211.2	184.9	250.5	274.4	103.8	103.8	131.2	149.1	E	126	53	42	N	37	28	2
54	Seoul	GeumCheon	시흥	남서울건영 2 차	1989.07.	619	3	2	84.81	191.0	182.8	247.6	277.1	100.2	106.1	141.5	159.2	E	126	54	39	N	37	26	57
55	Seoul	GeumCheon	시흥	성지	1986.09.	233	3	2	84.81	165.1	149.7	235.8	265.3	84.9	90.8	106.1	123.8	E	126	53	53	N	37	27	3
56	Seoul	NoWon	공릉	삼익	1995.10.	845	3	2	84.48	201.2	179.9	242.7	369.9	103.0	103.0	148.0	171.6	E	127	4	55	N	37	37	36
57	Seoul	NoWon	상계	금호	1994.11.	230	3	2	84.48	179.9	165.7	215.4	290.0	100.6	103.0	130.2	150.9	E	127	4	7	N	37	40	2
58	Seoul	NoWon	상계	현대 4 차	1993.12.	106	3	2	84.81	167.4	152.1	200.4	265.3	84.9	96.7	106.1	144.4	E	127	3	2	N	37	40	23
59	Seoul	NoWon	상계 1	수락현대	1993	216	3	2	84.48	191.8	165.7	230.8	272.3	85.2	103.0	118.4	165.7	E	127	3	36	N	37	40	30
60	Seoul	NoWon	월계	서광	1994.07.	274	3	2	84.15	208.0	172.3	249.6	285.2	101.0	112.9	130.7	155.7	E	127	3	54	N	37	37	23
61	Seoul	NoWon	중계	성원	1996.02.	402	3	2	84.48	215.4	201.2	219.0	438.0	97.1	118.4	189.4	236.7	E	127	4	11	N	37	39	0
62	Seoul	NoWon	중계본	현대 2 차	1993.11.	313	3	2	84.81	194.6	159.2	241.7	309.5	96.7	108.5	165.1	176.9	E	127	5	4	N	37	38	52

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m^2$)				Rent (JeonSe*) (10 US $/m^2$)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
63	Seoul	NoWon	하계	벽산	1988.05.	630	3	2	84.48	207.1	177.6	272.3	440.9	103.0	124.3	159.8	219.0	E	127	3	54	N	37	38	8
64	Seoul	DoBong	도봉	럭키	1992.09.	630	3	2	84.48	183.5	162.2	219.0	278.2	85.2	97.1	106.5	136.1	E	127	2	39	N	37	40	44
65	Seoul	DoBong	방학	신동아 3 단지	1992.09.	210	3	2	84.48	183.5	171.6	207.1	227.9	93.5	108.9	124.3	118.4	E	127	1	22	N	37	39	36
66	Seoul	DoBong	방학	벽산	1996.11.	318	3	2	84.81	188.7	165.1	212.2	238.8	100.2	106.1	123.8	117.9	E	127	1	30	N	37	39	31
67	Seoul	DoBong	쌍문	한양 7 차	1991.05.	408	3	2	84.48	197.7	174.0	207.1	284.1	103.0	108.9	124.3	136.1	E	127	2	1	N	37	39	21
68	Seoul	DoBong	창	대우	1995.11.	952	3	2	84.48	215.4	191.8	248.6	287.1	91.1	108.9	130.2	153.9	E	127	2	15	N	37	38	32
69	Seoul	DoBong	창	동아	1989.01.	600	3	2	89.1	202.0	179.6	246.9	426.5	97.6	114.5	134.7	165.5	E	127	3	1	N	37	39	4
70	Seoul	DongDaeMoon	답십리	신답경남	1991.07.	225	3	2	82.17	191.1	166.7	286.0	310.3	97.4	112.0	146.0	152.1	E	127	2	40	N	37	34	29
71	Seoul	DongDaeMoon	답십리	동답한신	1991.12.	600	3	2	82.17	209.3	178.9	237.3	264.7	105.9	105.9	146.0	146.0	E	127	3	45	N	37	34	15
72	Seoul	DongDaeMoon	용두	신동아	1992.12.	772	3	2	84.48	224.9	197.7	316.1	349.2	136.1	130.2	153.9	177.6	E	127	1	56	N	37	34	21
73	Seoul	DongDaeMoon	장안	장안현대	1984.07.	456	3	2	95.04	149.4	128.4	233.6	273.6	91.5	86.3	105.2	115.7	E	127	4	8	N	37	34	52
74	Seoul	DongDaeMoon	전농	우성	1991.07.	1234	3	2	84.48	201.2	174.0	230.8	301.8	114.8	106.5	136.1	145.0	E	127	3	54	N	37	34	38
75	Seoul	DongDaeMoon	회기	신현대	1989.05.	736	3	2	84.81	218.1	194.6	271.2	324.3	117.9	123.8	153.3	182.8	E	127	3	6	N	37	35	22
76	Seoul	DongJak	노량진	우성	1995.11.	901	3	2	84.81	283.0	220.5	312.5	536.5	114.4	123.8	176.9	229.9	E	126	56	52	N	37	30	34
77	Seoul	DongJak	대방	대림	1993.10.	1628	3	2	84.48	298.3	319.6	473.5	680.6	171.6	171.6	224.9	290.0	E	126	55	28	N	37	30	27
78	Seoul	DongJak	본	신동아	1993.07.	765	3	2	84.15	228.2	202.0	297.1	487.2	115.3	115.3	136.7	184.2	E	126	57	6	N	37	30	36
79	Seoul	DongJak	사당	극동	1992.10.	1550	3	2	84.15	243.6	255.5	338.7	558.5	124.8	142.6	178.3	219.8	E	126	58	29	N	37	29	26
80	Seoul	DongJak	노량진	상도건영	1997.08.	824	3	2	84.48	278.2	236.7	333.8	550.4	112.5	142.0	189.4	224.9	E	126	56	58	N	37	30	27
81	Seoul	DongJak	신대방	현대	1995.10.	880	3	2	84.15	255.5	234.1	338.7	505.1	121.2	136.7	178.3	225.8	E	126	54	43	N	37	29	42
82	Seoul	Mapo	공덕	공덕현대	1989.01.	183	3	2	84.15	192.5	184.2	323.2	439.7	115.3	130.7	166.4	196.1	E	126	57	0	N	37	32	53
83	Seoul	Mapo	도화	우성	1991.03.	1230	3	2	79.53	264.1	220.0	377.2	528.1	134.5	147.1	176.0	207.5	E	126	56	54	N	37	32	10
84	Seoul	Mapo	도화	현대	1993.08.	1021	3	2	79.53	264.1	222.6	308.1	628.7	144.6	134.5	201.2	213.8	E	126	57	14	N	37	32	22
85	Seoul	Mapo	신수	현대	1990.12.	210	3	2	84.15	228.2	208.0	338.7	404.0	124.8	127.2	154.5	190.1	E	126	56	13	N	37	32	34
86	Seoul	Mapo	연남	대명	1996.01.	128	3	2	84.81		200.4	259.4	336.0		153.3	165.1	176.9	E	126	55	25	N	37	33	42
87	Seoul	Mapo	중	청구	1993.09.	420	3	2	84.48		227.3	402.5	503.1		120.7	153.9	213.1	E	126	54	6	N	37	34	26
88	Seoul	SeoDaeMoon	북가좌	한양	1986.12.	660	3	2	84.15	192.5	166.4	269.8	320.9	103.4	103.4	142.6	148.5	E	126	54	32	N	37	34	33
89	Seoul	SeoDaeMoon	연희	대림	1993.01.	220	3	2	84.48	260.4	248.6	319.6	361.0	148.0	136.1	177.6	224.9	E	126	56	10	N	37	34	31
90	Seoul	SeoDaeMoon	영천	독립문삼호	1995.06.	895	3	2	84.48	242.7	248.6	372.9	485.3	97.7	162.2	201.2	236.7	E	126	57	30	N	37	34	11
91	Seoul	SeoDaeMoon	충정로	현대	1992.12.	83	3	2	84.48		195.3	349.2	355.1		120.7	177.6	219.0	E	126	57	47	N	37	33	49
92	Seoul	SeoDaeMoon	홍은	벽산	1995.04.	1509	3	2	84.81	229.9	194.6	279.4	333.1	112.0	123.8	153.3	171.0	E	126	56	41	N	37	35	41
93	Seoul	SeoDaeMoon	홍은	풍림 2 차	1989.09.	390	3	2	84.48	219.0	183.5	254.5	272.3	108.9	114.8	142.0	168.7	E	126	56	34	N	37	35	35
94	Seoul	SeoDaeMoon	홍제	한양	1992.07.	998	3	2	84.48	254.5	230.8	343.3	399.5	142.0	136.1	177.6	207.1	E	126	56	49	N	37	34	59
95	Seoul	SeoDaeMoon	홍제	홍제현대	1992.01.	704	3	2	82.83	265.6	295.8	332.0	392.4	144.9	163.0	205.2	211.3	E	126	56	28	N	37	35	20
96	Seoul	SeoCho	반포	새서울	1994.07.	154	3	2	83.16	276.6	282.6	547.1	655.4	144.3	174.4	228.5	324.7	E	127	0	36	N	37	29	57
97	Seoul	SeoCho	반포	미도 1 차	1988.12.	1260	3	1	82.5	278.8	284.8	636.4	1121.2	133.3	175.8	206.1	321.2	E	127	0	30	N	37	30	4
98	Seoul	SeoCho	방배	대우효령	1992.12.	364	3	2	84.48	361.0	331.4	562.3	840.4	171.6	195.3	224.9	325.5	E	126	59	38	N	37	28	46
99	Seoul	SeoCho	방배	우성	1990.12.	468	3	1	84.81	247.6	253.5	456.3	748.7	129.7	153.3	206.3	277.1	E	126	58	58	N	37	28	27
100	Seoul	SeoCho	서초	유원	1992.08.	590	3	2	84.48	355.1	351.6	639.2	905.5	183.5	213.1	272.3	307.8	E	127	1	6	N	37	29	46
101	Seoul	SeoCho	서초	우성 5 차	1996.05.	408	3	2	84.48	319.6	337.4	532.7	964.7	148.0	203.6	230.8	313.7	E	127	1	36	N	37	29	40
102	Seoul	SeoCho	양재	우성	1990.12.	997	3	2	84.48	274.6	260.4	485.3	787.2	130.2	159.8	213.1	260.4	E	127	1	50	N	37	28	30
103	Seoul	SeoCho	우면	동양고속	1995.04.	330	3	2	84.81	377.3	371.4	589.6	849.0	176.9	218.1	271.2	306.6	E	127	1	25	N	37	28	16
104	Seoul	SeoCho	잠원	현대	1992.12.	238	3	2	84.48	349.2	337.4	591.9	899.6	177.6	207.1	272.3	319.6	E	127	0	45	N	37	31	5
105	Seoul	SeongDong	금호	두산	1993.12.	1267	3	2	84.81	294.8	225.2	371.4	648.5	147.4	141.5	200.4	224.0	E	127	0	58	N	37	32	59
106	Seoul	SeongDong	성수	현대그린	1994.11.	219	3	2	81.18		203.3	357.2	560.5		129.3	160.1	197.1	E	127	2	59	N	37	32	26
107	Seoul	SeongDong	옥수	극동그린	1996.06.	583	3	2	84.81	312.5	312.5	418.6	542.4	171.0	153.3	218.1	259.4	E	127	0	36	N	37	32	30
108	Seoul	SeongDong	응봉	신동아	1996.04.	434	3	2	84.48	233.2	207.1	307.8	355.1	114.8	120.7	165.7	162.8	E	127	1	45	N	37	32	59
109	Seoul	SeongDong	하왕십리	청계벽산	1996.06.	1332	3	2	85.14		225.5	422.8	493.3		146.8	164.4	193.8	E	127	1	53	N	37	34	8
110	Seoul	SeongDong	행당	신동아	1995.07.	636	3	2	84.81	226.4	206.3	318.4	436.3	114.4	119.1	165.1	182.8	E	127	1	57	N	37	33	14
111	Seoul	SeongDong	행당	삼부	1996.11.	498	3	2	84.15	285.2	249.6	356.5	582.3	118.8	142.6	190.1	249.6	E	127	2	15	N	37	33	35
112	Seoul	SeongBook	길음	삼부	1992.09.	684	3	2	84.81	196.9	171.0	271.2	336.0	112.0	120.3	153.3	159.2	E	127	1	25	N	37	36	9
113	Seoul	SeongBook	돈암	현대	1991.06.	619	3	1	84.81	179.2	173.3	235.8	300.7	106.1	114.4	129.7	150.3	E	127	1	41	N	37	36	15
114	Seoul	SeongBook	보문	아남	1994.10.	218	3	2	84.81	194.6	171.0	229.9	324.3	96.7	94.3	117.9	165.1	E	127	1	2	N	37	34	52
115	Seoul	SeongBook	석관	중앙하이츠	1994.06.	315	3	2	84.81	182.8	155.6	229.9	271.2	102.6	96.7	117.9	147.4	E	127	3	58	N	37	36	42
116	Seoul	SeongBook	종암	종암선경	1995.10.	238	3	2	84.48	219.0	195.3	262.8	284.1	108.9	114.8	153.9	177.6	E	127	2	1	N	37	35	39
117	Seoul	SeongBook	하월곡	아남	1996.12.	198	3	2	84.48	209.5	183.5	227.3	290.0	108.9	114.8	142.0	153.9	E	127	2	5	N	37	36	20
118	Seoul	SongPa	가락	삼환	1985.06.	648	3	1	84.48	245.0	239.1	544.5	757.6	120.7	156.3	183.5	219.0	E	127	8	12	N	37	29	43
119	Seoul	SongPa	거여	현대 3 차	1993.07.	303	3	2	84.81	224.0	208.7	324.3	577.8	108.5	123.8	165.1	191.6	E	127	8	41	N	37	29	49
120	Seoul	SongPa	문정	건영	1993.01.	545	3	2	77.55	273.4	260.5	470.7	805.9	125.1	161.2	180.5	251.5	E	127	7	32	N	37	28	53
121	Seoul	SongPa	송파	성지	1992.09.	298	3	2	84.81	277.1	247.6	459.9	636.7	129.7	155.6	212.2	247.6	E	127	7	2	N	37	30	1
122	Seoul	SongPa	오금	대림	1989.01.	749	3	1	84.81	277.1	271.2	619.0	878.4	135.6	165.1	224.0	277.1	E	127	7	45	N	37	30	36

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
123	Seoul	SongPa	잠실	현대	1990.09.	336	3	2	84.48	284.1	278.2	538.6	763.5	144.4	162.2	201.2	230.8	E	127	5	7	N	37	30	14
124	Seoul	SongPa	잠실	우성 4 차	1983.09.	555	3	1	95.37	243.3	230.7	540.0	707.8	120.6	131.1	209.7	204.5	E	127	4	58	N	37	30	10
125	Seoul	SongPa	풍납	쌍용	1995.07.	417	3	2	84.48	272.3	254.5	428.5	651.0	124.3	136.1	201.2	230.8	E	127	7	3	N	37	31	37
126	Seoul	YangCheon	목	대림 2 차	1994.06.	262	3	2	84.48	254.5	227.3	402.5	710.2	124.3	148.0	213.1	278.2	E	126	52	27	N	37	31	24
127	Seoul	YangCheon	목	우성	1992.05.	332	3	2	84.48	250.9	236.7	449.8	840.4	132.6	148.0	213.1	266.3	E	126	52	31	N	37	32	84
128	Seoul	YangCheon	목	한신청구	1993.09.	1512	3	2	84.48	254.5	230.8	467.6	858.2	124.3	162.2	213.1	284.1	E	126	52	53	N	37	32	29
129	Seoul	YangCheon	신월	성원	1997.01.	170	3	2	83.16		128.7	198.4	186.4		86.6	132.3	114.2	E	126	50	1	N	37	31	41
130	Seoul	YangCheon	신정	대림 1 차	1992.02.	210	3	2	84.48	230.8	201.2	339.7	580.0	112.5	136.1	177.6	251.5	E	126	52	24	N	37	31	3
131	Seoul	YeongDeungPo	당산	강마을삼성	1995.05.	348	3	2	84.81		235.8	371.4	518.8		135.6	206.3	224.0	E	126	54	21	N	37	32	3
132	Seoul	YeongDeungPo	대림	우성 2 차	1992.12.	120	3	2	79.86	244.2	206.6	296.8	394.4	121.5	121.5	175.3	200.4	E	126	54	2	N	37	29	46
133	Seoul	YeongDeungPo	도림	청구	1997.12.	200	3	2	84.81	200.4	206.3	288.9	353.7	67.8	123.8	159.2	171.0	E	126	53	43	N	37	30	33
134	Seoul	YeongDeungPo	신길	우성 5 차	1993.05.	321	3	2	84.81	202.8	179.2	261.8	341.9	108.5	117.9	141.5	179.8	E	126	54	13	N	37	30	24
135	Seoul	YeongDeungPo	양평	한신	1990.01.	457	3	2	85	229.4	200.0	332.4	523.5	91.2	114.7	147.1	194.1	E	126	53	32	N	37	32	24
136	Seoul	YeongDeungPo	여의도	미성	1978.06.	577	3	1	82	353.7	329.3	640.2	1115.9	158.5	182.9	231.7	280.5	E	126	55	28	N	37	31	11
137	Seoul	YongSan	보광	신동아	1991.12.	226	3	2	84.48	272.3	248.6	355.1	568.2	142.0	153.9	201.2	189.4	E	127	0	6	N	37	31	33
138	Seoul	YongSan	서빙고	신동아	1984.06.	1326	3	1	95.37	241.2	319.8	545.2	896.5	125.8	152.0	199.2	225.4	E	126	59	16	N	37	31	5
139	Seoul	YongSan	이촌	대림	1994.05.	638	3	2	84.48	319.6	295.9	455.7	781.3	148.0	159.8	195.3	213.1	E	126	57	18	N	37	31	29
140	Seoul	YongSan	이촌	현대한강	1996.10.	516	3	2	84.48	171.6	319.6	497.2	757.6	114.8	162.2	189.4	219.0	E	126	57	30	N	37	31	22
141	Seoul	YongSan	이태원	남산대림	1994.10.	400	3	2	84.48	396.5	384.7	550.4	799.0	189.4	207.1	295.9	278.2	E	126	59	19	N	37	32	27
142	Seoul	EunPyung	녹번	대림	1993.09.	370	3	2	84.48	224.9	177.6	254.5	355.1	114.8	112.5	165.7	207.1	E	126	56	13	N	37	35	59
143	Seoul	EunPyung	불광	미성	1988.06.	1340	3	1	84.48	239.1	195.3	310.1	455.7	124.3	124.3	165.7	201.2	E	126	55	41	N	37	36	53
144	Seoul	EunPyung	신사	라이프시티	1992.12.	298	3	2	82.83	177.5	159.4	213.7	226.4	99.0	99.0	120.7	120.7	E	126	54	19	N	37	36	8
145	Seoul	EunPyung	신사	현대 1 차	1992.11.	445	3	2	84.15	172.3	184.2	231.7	306.0	89.1	97.4	107.0	166.4	E	126	54	31	N	37	35	36
146	Seoul	EunPyung	응암	경남	1995.12.	160	3	2	84.48	224.9	183.5	266.3	266.3	118.4	124.3	153.9	165.7	E	126	55	13	N	37	34	59
147	Seoul	EunPyung	응암	우성	1988.07.	292	3	1	80.52	182.6	163.9	204.9	257.7	108.0	108.0	149.0	145.9	E	126	55	5	N	37	35	2
148	Seoul	JongRo	교북	동아	1995.11.	48	3	2	84.15			291.1	309.0			178.3	190.1	E	126	57	43	N	37	34	17
149	Seoul	JongRo	명륜 2	명륜아남	1996.01.	436	3	2	84.48	295.9	301.8	420.2	523.8	165.7	177.6	236.7	266.3	E	126	59	57	N	37	35	8
150	Seoul	JongRo	무악	현대	1999.11.	1514	3	2	84.48		319.6	479.4	526.8		177.6	248.6	284.1	E	126	57	39	N	37	34	31
151	Seoul	JongRo	창신	쌍용 2 차	1993.06.	919	3	1	82.5	206.1	193.9	260.6	327.3	109.1	111.5	145.5	139.4	E	127	0	43	N	37	34	49
152	Seoul	JongRo	평창	삼성	1998.01	176	3	2	84.81		235.8	283.0	300.7		126.2	176.9	188.7	E	126	58	43	N	37	36	39
153	Seoul	Joong	신당	현대	1990.06.	942	3	1	83.82	202.8	173.0	292.3	429.5	107.4	119.3	167.0	167.0	E	127	1	17	N	37	33	35
154	Seoul	Joong	신당	남산타운	2000.06.	5150	3	2	84.81		336.0	507.0	683.9		188.7	224.0	283.0	E	127	0	35	N	37	32	59
155	Seoul	JoongRang	면목	용마동아	1993.01.	174	3	2	84.48		162.2	233.2	307.8		97.1	130.2	159.8	E	127	5	42	N	37	34	43
156	Seoul	JoongRang	면목	두산 1 차	1993.12.	122	3	2	84.48		183.5	230.8	331.4		108.9	153.9	177.6	E	127	5	2	N	37	34	53
157	Seoul	JoongRang	상봉	LG 쌍용	1996.02.	858	3	2	84.48	242.7	213.1	290.0	369.9	106.5	108.9	148.0	171.6	E	127	5	23	N	37	36	11
158	Seoul	JoongRang	신내	동성 3 차	1995.07.	1844	3	2	83.82	214.7	193.3	262.5	375.8	103.8	101.4	131.2	167.0	E	127	5	45	N	37	36	29
159	Seoul	JoongRang	신내	두산화성	1995.12.	763	3	2	84.81	253.5	220.5	318.4	430.4	96.7	123.8	159.2	200.4	E	127	5	42	N	37	36	47
160	Seoul	JoongRang	중화	한신	1996.09.	1544	3	2	84.48	221.4	197.7	278.2	372.9	97.1	112.5	148.0	183.5	E	127	4	53	N	37	35	48
161	InCheon	GangHwa	강화	현대	1994.04.	219	3	1	84.48		97.1	100.6	112.5		49.7	59.2	65.1	E	126	29	8	N	37	44	46
162	InCheon	GyeYang	계산	극동	1987.01.	630	4	1	84.81	126.2	123.8	202.8	274.1	61.3	70.7	94.3	106.1	E	126	43	26	N	37	32	46
163	InCheon	GyeYang	계산	한국	1991.05.	416	3	1	82.5	111.5	105.5	161.2	193.9	60.6	63.0	109.1	115.2	E	126	43	43	N	37	32	30
164	InCheon	GyeYang	계산	현대	1992.02.	1248	3	2	84.81	135.6	129.7	194.6	235.8	54.2	82.5	112.0	135.6	E	126	43	58	N	37	32	14
165	InCheon	GyeYang	작전	현대 2 차	1990.12.	840	3	2	84.81	143.9	103.8	181.6	200.4	64.9	73.1	100.2	103.2	E	126	44	18	N	37	31	44
166	InCheon	GyeYang	효성	현대 2 차	1992.12.	340	3	2	84.48	136.1	108.9	189.4	224.9	55.6	67.5	106.5	109.5	E	126	42	47	N	37	31	58
167	InCheon	Nam	관교	동부	1991.09.	420	3	2	84.81	132.1	129.7	208.7	209.3	73.1	84.9	129.7	135.6	E	126	41	47	N	37	26	29
168	InCheon	Nam	관교	쌍용	1991.07.	464	3	2	84.48	136.1	132.6	207.1	219.0	73.4	88.8	142.0	148.0	E	126	41	43	N	37	26	34
169	InCheon	Nam	도화	동아	1992.04.	496	3	2	84.48		111.3	171.6	165.7		73.4	100.6	91.7	E	126	39	58	N	37	27	56
170	InCheon	Nam	숭의	극동	1997.10.	133	3	1	84.81		114.4	167.4	179.8		69.6	70.7	88.4	E	126	38	54	N	37	28	3
171	InCheon	Nam	용현	한국	1996.07.	297	3	2	84.15		114.1	178.3	181.2		73.7	101.0	104.0	E	126	38	19	N	37	26	47
172	InCheon	Nam	주안	쌍용	1985.12.	768	3	2	94.71	95.0	89.7	155.2	166.3	52.8	54.9	89.7	89.7	E	126	40	48	N	37	26	48
173	InCheon	Nam	학익	신동아 5 차	1993.06.	594	3	2	84.48	124.3	106.5	195.3	201.2	73.4	79.3	118.4	118.4	E	126	40	39	N	37	26	36
174	InCheon	NamDong	간석	금호	1988.10.	630	3	2	84.48	125.5	113.6	210.7	206.0	67.5	79.3	118.4	136.1	E	126	41	58	N	37	27	28
175	InCheon	NamDong	간석	현대	1991.09.	390	3	2	84.81	120.9	120.3	206.3	191.6	67.8	82.5	117.9	123.8	E	126	41	35	N	37	28	4
176	InCheon	NamDong	구월	동아	1991.09.	486	3	2	84.48	114.8	114.8	189.4	183.5	73.4	76.9	106.5	112.5	E	126	42	40	N	37	26	53
177	InCheon	NamDong	만수	효성상아 2 차	1989.08.	180	3	1	84.48	119.6	111.3	171.6	177.6	71.0	74.6	88.8	112.5	E	126	43	21	N	37	27	26
178	InCheon	NamDong	만수	신동아	1990.06.	750	3	1	84.48	108.9	105.4	179.9	174.6	67.5	73.4	106.5	112.5	E	126	44	13	N	37	27	59
179	InCheon	NamDong	남촌	풍림 3 차	1999.10.	735	3	2	83.16		122.7	204.4	192.4		75.8	114.2	108.2	E	126	42	59	N	37	25	44
180	InCheon	Dong	송현	동부	1992.01.	1140	3	2	84.48		108.9	148.0	159.2		73.4	82.9	94.7	E	126	38	6	N	37	28	56
181	InCheon	BooPyung	갈산	동아	1993.06.	280	3	1	84.48	118.4	106.5	197.7	213.1	65.1	79.3	106.5	112.5	E	126	43	47	N	37	30	39
182	InCheon	BooPyung	부개	현대	1993.05.	200	3	2	84.81		117.9	165.1	227.0		79.0	94.3	120.9	E	126	44	28	N	37	29	14

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
183	InCheon	BooPyung	부평	동아 2 차	1995.02.	2128	3	2	84.48	174.0	156.3	268.7	355.1	73.4	97.1	130.2	165.7	E	126	43	6	N	37	29	47
184	InCheon	BooPyung	부평	대림	1989.12.	1470	3	2	84.81	120.3	110.8	188.7	218.1	67.2	73.1	112.0	115.0	E	126	43	2	N	37	30	7
185	InCheon	BooPyung	산곡	현대 5 차	1993.12.	1161	3	2	84.81	159.2	127.3	208.7	232.9	73.1	80.2	117.9	129.7	E	126	42	38	N	37	30	20
186	InCheon	BooPyung	산곡	우성 5 차	1996.12.	299	3	2	83.16		114.2	164.7	195.4		74.6	102.2	114.2	E	126	42	16	N	37	29	59
187	InCheon	BooPyung	청천	쌍용	1990.09.	510	3	2	84.48	108.9	104.2	183.5	230.8	59.2	79.3	106.5	127.2	E	126	42	57	N	37	30	25
188	InCheon	Seo	가정	한국	1994.01.	620	3	2	83.82		97.8	149.1	198.6		62.0	95.4	101.4	E	126	40	39	N	37	30	50
189	InCheon	Seo	가좌	진주 5 단지	1991.06.	268	3	2	84.48		118.4	191.8	189.4		76.9	118.4	106.5	E	126	41	8	N	37	29	30
190	InCheon	Seo	가좌	현대	1985.08.	460	3	1	84.81	96.7	90.8	165.1	153.3	67.2	67.2	94.3	97.3	E	126	40	53	N	37	29	42
191	InCheon	Seo	가좌	범양	1990.07.	510	3	2	84.81	114.4	108.5	179.2	168.0	67.2	70.7	106.1	103.2	E	126	41	17	N	37	29	44
192	InCheon	Seo	마전	동아	1998.11.	1351	3	2	84.48		106.5	161.0	307.8		59.2	65.1	85.8	E	126	40	22	N	37	35	50
193	InCheon	Seo	심곡	삼성	1997.06.	421	3	2	84.48		124.3	168.1	227.9		73.4	94.7	100.6	E	126	40	12	N	37	32	40
194	InCheon	Seo	연희	한국 1 차	1994.10.	356	3	2	84.48	111.3	103.0	159.8	201.2	59.2	71.0	71.0	96.5	E	126	40	31	N	37	33	3
195	InCheon	YeonSoo	동춘	대우삼환	1994.05.	1776	3	2	89.76	150.4	133.7	241.8	306.4	69.1	85.8	133.7	161.5	E	126	40	42	N	37	24	19
196	InCheon	YeonSoo	동춘	현대대림	1993.08.	700	3	2	96.03	142.7	130.2	249.9	255.1	64.6	75.0	125.0	125.0	E	126	40	24	N	37	24	31
197	InCheon	YeonSoo	선학	뉴서울	1992.10.	720	3	2	84.15	117.6	114.1	190.1	205.0	67.7	83.2	112.9	130.7	E	126	42	0	N	37	25	30
198	InCheon	YeonSoo	선학	금호	1993.01.	540	3	2	84.48	136.1	126.7	209.5	242.7	67.5	82.9	118.4	136.1	E	126	42	0	N	37	25	35
199	InCheon	YeonSoo	연수	풍림 1 차	1992.03.	769	3	2	84.81	119.1	106.1	200.4	229.9	59.0	79.0	117.9	135.6	E	126	41	31	N	37	25	3
200	InCheon	YeonSoo	연수	대림	1993.05.	640	3	2	84.48	136.1	121.9	227.3	271.1	59.2	79.3	118.4	148.0	E	126	41	38	N	37	25	10
201	InCheon	YeonSoo	옥련	럭키	1993.11.	1304	3	2	84.48	130.2	103.0	177.6	216.0	61.6	67.5	94.7	130.2	E	126	38	34	N	37	25	27
202	InCheon	YeonSoo	옥련	현대 5 차	1997.07.	621	3	2	84.15	162.8	145.0	213.9	228.8	67.7	79.6	107.0	133.7	E	126	38	47	N	37	25	38
203	InCheon	YeonSoo	청학	서해	1993.08.	294	3	2	84.48	136.1	112.5	203.6	221.9	62.1	73.4	112.5	142.0	E	126	39	56	N	37	25	18
204	GyeongGi	GoYang	고양	삼성	1998.11.	282	3	2	84.81		135.6	185.1	218.1		82.5	94.3	109.1	E	126	54	9	N	37	42	10
205	GyeongGi	GoYang	고양	현대	1997.11.	791	3	2	84.48		132.6	177.6	219.0		79.3	94.7	112.5	E	126	54	0	N	37	42	4
206	GyeongGi	GoYang	대화	장성동부	1995.11.	410	3	2	84.81	214.6	206.3	303.0	512.9	84.9	114.4	129.7	176.9	E	126	44	45	N	37	40	29
207	GyeongGi	GoYang	마두	강촌우방	1993.03.	766	3	2	84.81	229.9	218.1	347.8	613.1	94.3	117.9	165.1	206.3	E	126	46	52	N	37	39	20
208	GyeongGi	GoYang	마두	백마벽산	1994.08.	438	3	2	84.81	208.7	188.7	288.9	554.2	79.0	102.6	165.1	165.1	E	126	47	22	N	37	39	28
209	GyeongGi	GoYang	백석	백송대우	1994.06.	228	3	2	84.81	194.6	182.8	259.4	430.4	76.6	102.6	141.5	159.2	E	126	47	41	N	37	39	14
210	GyeongGi	GoYang	백석	흰돌국제한진	1994.08.	816	3	2	84.48	210.7	189.4	278.2	438.0	84.0	103.0	142.0	186.4	E	126	47	2	N	37	38	38
211	GyeongGi	GoYang	성사	신원당동문	1992.10.	354	3	2	84.81	173.3	161.5	224.0	356.7	73.1	96.7	129.7	159.2	E	126	50	22	N	37	39	11
212	GyeongGi	GoYang	성사	신원당태영	1993.11.	604	3	2	84.81	176.9	161.5	247.6	383.2	73.1	97.9	141.5	159.2	E	126	50	4	N	37	39	5
213	GyeongGi	GoYang	중산	중산경남	1995.03.	304	3	2	84.48	189.4	153.9	201.2	319.6	71.0	85.2	118.4	121.3	E	126	46	42	N	37	41	16
214	GyeongGi	GoYang	일산	후곡코오롱	1995.10.	474	3	2	84.48	221.4	224.9	361.0	532.7	85.2	103.0	159.8	189.4	E	126	46	6	N	37	40	33
215	GyeongGi	GoYang	일산	에이스	1994.12.	332	3	2	84.48	171.6	132.6	177.6	248.6	65.1	73.4	100.6	94.7	E	126	46	35	N	37	41	16
216	GyeongGi	GoYang	장항	호수청구	1994.03.	668	3	2	84.81	241.7	232.3	341.9	589.6	90.8	120.3	176.9	200.4	E	126	46	34	N	37	39	0
217	GyeongGi	GoYang	주엽	강선 LG	1993.01.	483	3	2	84.81	214.6	214.6	306.6	536.5	84.9	108.5	153.3	200.4	E	126	45	59	N	37	40	11
218	GyeongGi	GoYang	주엽	문촌우성 1 단지	1994.12.	892	3	2	84.81	214.6	191.0	312.5	536.5	84.9	106.1	141.5	165.1	E	126	45	30	N	37	40	40
219	GyeongGi	GoYang	탄현	탄현건영 5	1995.03.	624	3	2	84.15	184.2	145.0	198.5	421.9	67.7	79.6	95.1	124.8	E	126	45	58	N	37	41	46
220	GyeongGi	GoYang	행신	무원라이프	1994.12.	396	3	2	84.81	194.6	165.1	271.2	389.1	76.6	96.7	129.7	159.2	E	126	49	51	N	37	37	5
221	GyeongGi	GoYang	행신	소만신안	1996.03.	150	3	2	84.48	183.5	157.4	242.7	343.3	73.4	94.7	118.4	156.8	E	126	50	45	N	37	36	58
222	GyeongGi	GoYang	화정	별빛벽산	1995.11.	502	3	2	84.81	196.9	179.2	271.2	459.9	76.6	104.9	153.3	179.8	E	126	49	32	N	37	37	47
223	GyeongGi	GoYang	화정	옥빛주공 17 단지	1997.06.	1120	3	2	84.48	203.6	191.8	268.7	432.1	82.9	103.0	148.0	192.4	E	126	50	3	N	37	37	32
224	GyeongGi	GoYang	화정	달빛동부	1995.12.	446	3	2	84.48	191.8	171.6	248.6	396.5	73.4	100.6	136.1	171.6	E	126	49	53	N	37	38	50
225	GyeongGi	GwangMyung	광명	중앙하이츠 1 차	1993.07.	909	3	2	84.81	182.8	160.4	288.9	283.0	84.9	100.2	141.5	147.4	E	126	51	18	N	37	28	9
226	GyeongGi	GwangMyung	소하	미도 2 차	1993.03.	193	3	2	84.81	155.6	147.4	336.0	294.8	73.1	84.9	117.9	147.4	E	126	52	36	N	37	26	11
227	GyeongGi	GwangMyung	소하	성원	1994.05.	193	3	2	84.81	159.2	153.3	330.1	309.5	76.6	84.9	117.9	147.4	E	126	52	37	N	37	26	7
228	GyeongGi	GwangMyung	철산	쌍마한신	1992.11.	384	3	2	84.81	208.7	212.2	336.0	383.2	94.3	108.5	147.4	171.0	E	126	52	4	N	37	28	37
229	GyeongGi	GwangMyung	하안	현대	1995.11.	593	3	2	84.48	183.5	159.8	298.3	325.5	79.3	100.6	142.0	168.7	E	126	51	50	N	37	28	5
230	GyeongGi	GwangJoo	경안	나산	1996.01.	236	3	2	84.48		124.3	165.7	272.3		82.9	88.8	112.5	E	127	15	9	N	37	24	59
231	GyeongGi	GwangJoo	태전	성원 2 차	2000.10.	435	3	2	84.81		147.4	206.3	395.0		75.5	100.2	112.0	E	127	12	14	N	37	24	36
232	GyeongGi	GwangJoo	탄벌	탄벌리현대	2000.07.	545	3	2	84.48		151.5	215.4	313.7		82.9	106.5	118.4	E	127	12	35	N	37	25	36
233	GyeongGi	GwangJoo	실촌	LG	1997.01.	222	3	2	80.52	124.2	100.6	126.7	201.8	57.7	58.4	74.5	90.0	E	127	23	39	N	37	21	57
234	GyeongGi	GwangJoo	오포	쌍용	1999.02.	313	3	2	84.81		126.2	161.5	235.8		64.9	88.4	91.4	E	127	15	24	N	37	22	50
235	GyeongGi	GwangJoo	탄벌	동보	1996.06.	815	3	2	84.81	129.7	123.8	159.2	247.6	61.9	76.6	88.4	106.1	E	127	14	55	N	37	24	55
236	GyeongGi	GooRi	교문	대우동양고속	1994.11.	680	3	2	84.48	207.1	183.5	292.4	414.3	85.2	94.7	130.2	159.8	E	127	8	7	N	37	35	19
237	GyeongGi	GooRi	교문	구리우성	1994.08.	341	3	2	84.81	203.4	171.0	300.7	456.9	85.5	90.8	138.0	171.0	E	127	8	13	N	37	35	17
238	GyeongGi	GooRi	수택	대림한숲	1995.08.	956	3	2	84.15	219.8	180.6	285.2	404.0	95.1	97.4	130.7	166.4	E	127	8	20	N	37	35	25
239	GyeongGi	GooRi	수택	쌍용	1996.12.	241	3	2	84.48	207.1	174.0	233.2	349.2	88.8	94.7	126.7	153.9	E	127	8	23	N	37	35	39
240	GyeongGi	GooRi	인창	삼호	1992.05.	240	3	2	80.85	173.2	120.0	191.7	235.0	74.2	74.2	92.8	117.5	E	127	8	10	N	37	36	12
241	GyeongGi	GooRi	인창	건영	1993.11.	573	3	2	84.81	179.2	132.1	202.8	280.0	76.6	79.0	112.0	123.8	E	127	8	12	N	37	36	44
242	GyeongGi	GoonPo	광정	목련우방.한국공영	1994.10.	639	3	2	84.81	220.5	191.0	250.6	471.6	90.8	114.4	153.3	212.2	E	126	55	45	N	37	22	5

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
243	GyeongGi	GoonPo	당	두산	1993.01.	248	3	2	84.81	155.6	135.6	188.7	324.3	73.1	96.7	117.9	162.1	E	126	56	44	N	37	20	52
244	GyeongGi	GoonPo	당	동아	1993.01.	482	3	2	84.48		138.5	197.7	325.5		97.1	118.4	159.8	E	126	56	48	N	37	20	58
245	GyeongGi	GoonPo	금정	다산주공 3	1992.06.	829	3	2	84.81	202.8	186.3	259.4	451.0	88.4	119.1	153.3	206.3	E	126	55	52	N	37	21	4
246	GyeongGi	GimPo	감정	신화	1995.06.	654	3	2	84.81	147.4	110.8	165.1	224.0	67.2	61.3	76.6	100.2	E	126	42	2	N	37	37	29
247	GyeongGi	GimPo	감정	효성	1996.07.	242	3	2	84.81	185.1	141.5	200.4	312.5	79.0	70.7	82.5	97.3	E	126	42	5	N	37	37	36
248	GyeongGi	GimPo	고촌	길훈 1 차	1991.12.	163	3	2	84.81	147.4	114.4	196.9	188.7	67.2	70.7	94.3	85.5	E	126	46	11	N	37	36	16
249	GyeongGi	GimPo	풍무	길훈 1 차	1993.01.	219	3	2	84.81		99.0	135.6	162.1		49.5	64.9	76.6	E	126	43	9	N	37	36	47
250	GyeongGi	NamYangJoo	별내	동부	1996.04.	456	3	2	84.81	132.1	108.5	143.9	188.7	59.0	59.0	76.6	85.5	E	127	12	47	N	37	41	29
251	GyeongGi	NamYangJoo	오남	오남청구	2000.10.	429	3	2	84.81		106.1	134.4	165.1		48.3	64.9	59.0	E	127	11	56	N	37	41	58
252	GyeongGi	NamYangJoo	와부	강변삼익	1996.04.	880	3	2	84.81	194.6	167.4	265.3	300.7	76.6	73.1	94.3	112.0	E	127	12	27	N	37	35	10
253	GyeongGi	NamYangJoo	진건	한신그린 1 차	1992.01.	706	3	2	84.81		96.7	119.1	120.9		59.0	76.6	67.8	E	127	12	24	N	37	44	49
254	GyeongGi	NamYangJoo	진접	대명	1995.09.	405	3	2	84.81		96.7	115.6	132.6		59.0	70.7	76.6	E	127	9	40	N	37	42	11
255	GyeongGi	NamYangJoo	퇴계원	극동	1999.03.	498	3	2	84.48		138.5	191.8	248.6		73.4	100.6	103.6	E	127	8	19	N	37	38	55
256	GyeongGi	NamYangJoo	화도	삼신	1995.01.	345	3	2	84.48		92.3	130.2	142.0		53.3	65.1	82.9	E	127	19	27	N	37	38	59
257	GyeongGi	NamYangJoo	화도	마석건영	1997.01.	213	3	2	83		80.7	115.7	114.5		44.6	60.2	57.2	E	127	18	9	N	37	39	29
258	GyeongGi	DongDooCheon	생연	에이스 2 차	1993.06.	286	3	2	84.48		72.2	76.9	76.9		41.4	39.1	43.2	E	127	3	43	N	37	53	36
259	GyeongGi	DongDooCheon	생연	우성	1992.12.	163	3	2	85		82.4	68.2	67.1		41.2	38.8	37.6	E	127	3	46	N	37	54	31
260	GyeongGi	DongDooCheon	생연 2	건영	1995.11.	397	3	2	84.81		71.9	75.5	78.4		38.9	44.8	38.9	E	127	2	37	N	37	53	44
261	GyeongGi	BooCheon	괴안	삼익	1989.08.	682	3	2	84.48	153.9	130.2	203.6	278.2	85.2	94.7	112.5	112.5	E	126	48	11	N	37	28	38
262	GyeongGi	BooCheon	여월	영화	1990.01.	105	3	2	85		108.8	123.5	164.7		64.7	91.2	105.9	E	126	47	59	N	37	31	13
263	GyeongGi	BooCheon	상	반달삼익	1993.04.	828	3	2	84.81	182.8	152.1	283.0	383.2	79.0	107.3	135.6	176.9	E	126	45	32	N	37	29	46
264	GyeongGi	BooCheon	상	한아름현대	1994.06.	824	3	2	84.48	195.3	165.7	266.3	396.5	85.2	103.0	130.2	165.7	E	126	44	55	N	37	29	41
265	GyeongGi	BooCheon	소사	한신	1988.10.	916	3	1	83.82	133.6	115.7	179.0	262.5	74.0	74.0	113.3	104.4	E	126	48	2	N	37	28	26
266	GyeongGi	BooCheon	소사	풍림	1996.09.	714	3	2	84.81	162.1	149.7	235.8	324.3	79.6	96.7	106.1	135.6	E	126	48	4	N	37	27	56
267	GyeongGi	BooCheon	송내	뉴서울	1995.10.	971	3	2	84.81	171.0	161.5	259.4	324.3	82.5	102.6	129.7	159.2	E	126	45	45	N	37	29	9
268	GyeongGi	BooCheon	송내	현대 2 차	1990.02.	372	4	2	84.81	147.4	141.5	212.2	247.6	90.8	96.7	117.9	134.4	E	126	45	39	N	37	28	59
269	GyeongGi	BooCheon	송내	우성고층	1990.04.	798	3	2	84.81	141.5	153.3	247.6	303.6	84.9	90.8	141.5	147.4	E	126	45	36	N	37	29	5
270	GyeongGi	BooCheon	심곡	극동	1980.04.	495	3	1	84.81	153.3	135.6	212.2	250.6	82.5	90.8	112.0	117.9	E	126	46	52	N	37	28	36
271	GyeongGi	BooCheon	심곡	태경삼익	1985.05.	128	3	1	80.19	134.1	130.9	168.4	190.2	81.1	74.8	112.2	115.4	E	126	46	52	N	37	28	40
272	GyeongGi	BooCheon	역곡	한국	1996.08.	497	3	2	84.48	183.5	162.2	219.0	254.5	79.3	91.1	118.4	142.0	E	126	48	49	N	37	29	35
273	GyeongGi	BooCheon	원미	풍림	1999.01.	808	3	2	84.48		165.7	219.0	325.5		100.6	118.4	148.0	E	126	47	29	N	37	29	29
274	GyeongGi	BooCheon	원종	신동문	1998.07.	216	3	2	83.49		140.1	200.0	251.5		80.2	107.8	122.8	E	126	47	53	N	37	31	45
275	GyeongGi	BooCheon	중	그린타운우성 2 차	1994.12.	340	3	2	84.81	194.6	173.3	314.8	436.3	84.9	108.5	141.5	176.9	E	126	46	11	N	37	29	51
276	GyeongGi	BooCheon	중	연화건영	1994.04.	424	3	2	84.15	180.6	160.4	251.9	398.1	83.2	109.3	130.7	145.6	E	126	46	48	N	37	29	56
277	GyeongGi	BooCheon	중	미리내금호	1995.03.	336	3	2	84.81	206.3	182.8	300.7	454.0	88.4	108.5	141.5	182.8	E	126	46	26	N	37	29	59
278	GyeongGi	BooCheon	중	복사골건영	1993.03.	330	3	2	84.15	180.6	154.5	263.8	392.2	79.6	109.3	130.7	157.5	E	126	46	5	N	37	29	42
279	GyeongGi	BooCheon	중	꿈삼환	1994.07.	348	3	2	81.18	187.2	168.8	283.3	455.8	82.5	107.2	135.5	160.1	E	126	46	46	N	37	30	3
280	GyeongGi	SeongNam	구미	까치대우	1995.12.	976	3	2	84.81	279.4	271.2	507.0	754.6	106.1	155.6	206.3	253.5	E	127	7	2	N	37	21	0
281	GyeongGi	SeongNam	금곡	청솔한라	1995.12.	768	3	2	84.15	237.7	243.6	457.5	665.5	95.1	136.7	178.3	219.8	E	127	6	24	N	37	21	21
282	GyeongGi	SeongNam	이매동	아름두산	1992.08.	566	3	2	84.48	242.7	224.9	481.8	716.1	108.9	138.5	195.3	242.7	E	127	7	11	N	37	24	0
283	GyeongGi	SeongNam	분당	샛별동성	1992.06.	582	3	2	84.48	245.0	236.7	473.5	710.2	103.0	136.1	201.2	248.6	E	127	7	55	N	37	22	20
284	GyeongGi	SeongNam	서현	효자동아	1992.07.	648	3	2	84.48	248.6	230.8	532.7	739.8	106.5	148.0	195.3	266.3	E	127	8	7	N	37	22	39
285	GyeongGi	SeongNam	서현	효자화성	1994.09.	564	3	2	84.48	260.4	248.6	485.3	692.5	108.9	159.8	189.4	260.4	E	127	8	10	N	37	22	20
286	GyeongGi	SeongNam	성남	현대	1991.07.	375	3	2	84.15	172.3	156.9	255.5	326.8	85.6	101.0	124.8	148.5	E	127	8	25	N	37	25	45
287	GyeongGi	SeongNam	수내	푸른신성	1992.06.	642	3	2	84.48	248.6	248.6	509.0	781.3	103.0	153.9	189.4	266.3	E	127	7	37	N	37	22	6
288	GyeongGi	SeongNam	수진	현대	1994.10.	107	3	2	84.81		148.6	218.1	353.7		106.1	141.5	147.4	E	127	7	54	N	37	26	23
289	GyeongGi	SeongNam	신흥	두산	1993.02.	570	3	2	84.48	177.6	179.9	298.3	544.5	85.2	103.0	153.9	159.8	E	127	8	58	N	37	26	42
290	GyeongGi	SeongNam	신흥	한신	1990.09.	585	3	2	84.81	176.9	171.0	297.1	548.3	84.9	102.6	153.3	159.2	E	127	9	6	N	37	26	41
291	GyeongGi	SeongNam	야탑	장미동부	1993.02.	1134	3	2	84.81	250.0	253.5	489.3	742.8	108.5	141.5	188.7	247.6	E	127	7	39	N	37	24	55
292	GyeongGi	SeongNam	은행	현대	1992.05.	1258	3	2	84.48	165.7	150.3	256.9	438.0	85.2	106.5	142.0	159.8	E	127	9	46	N	37	27	5
293	GyeongGi	SeongNam	하대원	현대	1995.04.	314	3	2	84.81	179.2	176.9	283.0	392.1	96.7	108.5	141.5	168.0	E	127	9	5	N	37	25	57
294	GyeongGi	SeongNam	야탑	탑선경	1992.08.	976	3	2	83.49	239.5	233.6	491.1	706.7	104.2	149.7	179.7	251.5	E	127	7	15	N	37	24	27
295	SooWon	GwonSeon	곡반정	삼성	2000.10.	442	3	2	84.48		136.1	242.7	328.5		85.2	112.5	130.2	E	127	1	44	N	37	14	5
296	SooWon	GwonSeon	구운	성원	1999.10.	458	3	2	84.81		143.9	229.9	297.7		79.0	129.7	159.2	E	126	58	34	N	37	16	59
297	SooWon	GwonSeon	권선	삼천리 1 차	1994.05.	496	3	2	84.81	162.7	126.2	208.7	241.7	88.4	84.9	129.7	153.3	E	127	1	26	N	37	15	7
298	SooWon	GwonSeon	권선	벽산삼호	1996.03.	368	3	2	84.81	185.1	146.2	253.5	383.2	96.7	102.6	141.5	199.3	E	127	1	59	N	37	15	2
299	SooWon	GwonSeon	금곡	삼익 1 차	1995.05.	400	3	2	84.48		108.9	156.3	245.6	61.6	65.1	76.9	112.5	E	126	57	16	N	37	16	16
300	SooWon	YoungTong	매탄	임광	1990.12.	1320	3	2	84.81	138.0	108.5	200.4	389.1	79.0	82.5	117.9	165.1	E	127	2	27	N	37	15	18
301	SooWon	YoungTong	매탄	삼성 2 차	1989.07.	624	3	2	84.81	155.6	114.4	202.8	312.5	79.0	84.9	112.0	153.3	E	127	2	36	N	37	16	9
302	SooWon	YoungTong	매탄	현대	1988.01.	690	3	2	84.81	149.7	117.9	212.2	368.5	94.3	90.8	106.1	147.4	E	127	2	33	N	37	16	4

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
303	SooWon	GwonSeon	세류	삼익	1999.01.	344	3	2	84.81		147.4	194.6	271.2		82.5	112.0	147.4	E	127	1	2	N	37	15	40
304	SooWon	GwonSeon	세류	현대	1990.05	276	3	2	84.81		94.3	181.6	200.4		67.2	106.1	123.8	E	127	1	1	N	37	15	37
305	SooWon	YoungTong	영통	청명벽산	1997.12.	621	3	2	84.81	175.1	188.7	314.8	507.0	61.9	108.5	141.5	206.3	E	127	4	31	N	37	15	26
306	SooWon	JangAn	영화	태영	1992.11.	117	3	2	84.81		114.4	147.4	176.9		73.1	106.1	103.2	E	127	0	27	N	37	17	19
307	SooWon	PalDal	우만	선경	1995.10.	372	3	2	84.81	191.0	159.2	215.8	283.0	83.7	102.6	129.7	165.1	E	127	2	11	N	37	16	30
308	SooWon	JangAn	율전	삼성 2 단지	1998.08.	700	3	2	84.81		149.7	253.5	339.0		94.3	123.8	179.8	E	126	58	8	N	37	17	39
309	SooWon	PalDal	인계	선경 1 차	1993.06.	360	3	2	85	164.7	147.1	211.8	305.9	76.5	100.0	129.4	152.9	E	127	2	11	N	37	16	34
310	SooWon	JangAn	정자	동신	1987.03.	1548	3	1	76.89	118.4	101.4	176.9	292.6	74.1	84.5	104.0	105.3	E	126	59	38	N	37	18	13
311	SooWon	JangAn	조원	벽산	1989.07.	740	3	2	84.15		104.6	172.3	261.4		79.6	101.0	112.9	E	127	1	16	N	37	17	51
312	SooWon	JangAn	파장	현대	1992.04.	225	3	2	79.2		109.8	166.7	227.3		75.8	94.7	121.8	E	127	0	2	N	37	18	28
313	SooWon	GwonSeon	호매실	삼익 2 차	1998.06.	354	3	2	84.81		102.6	156.8	241.7		64.9	76.6	113.2	E	126	57	26	N	37	16	8
314	GyeongGi	SiHeung	거모	아주 4 차	1993.01.	299	3	2	84.81		87.3	126.2	156.2		49.5	70.7	79.6	E	126	46	58	N	37	20	42
315	GyeongGi	SiHeung	대야	벽산	1992.02.	246	3	2	84.81	135.6	112.0	159.2	235.8	67.2	70.7	100.2	106.1	E	126	47	34	N	37	26	53
316	GyeongGi	SiHeung	대야	우남한신	1997.02.	350	3	2	84.81		123.8	155.6	229.9		66.0	106.1	120.9	E	126	47	38	N	37	27	0
317	GyeongGi	SiHeung	도창	에이스	1997.01.	798	3	2	84.81		101.4	142.7	194.6		64.9	59.0	97.3	E	126	49	0	N	37	24	35
318	GyeongGi	SiHeung	신천	우남한신	1997.01.	186	3	2	84.81		112.0	153.3	221.1		67.2	82.5	112.0	E	126	47	17	N	37	25	55
319	GyeongGi	SiHeung	장곡	진말우성	1999.06.	320	3	2	84.48		138.5	182.3	266.3		71.0	82.9	121.3	E	126	47	11	N	37	22	50
320	GyeongGi	SiHeung	정왕	미주	1996.11.	492	3	2	84.48		101.8	148.0	219.0		63.9	82.9	106.5	E	126	43	43	N	37	21	33
321	GyeongGi	SiHeung	정왕	신동아	1996.10.	790	3	2	84.81	108.5	95.5	132.1	200.4	38.9	63.7	76.6	100.2	E	126	43	15	N	37	21	30
322	GyeongGi	SiHeung	정왕	한신	1996.03.	406	3	2	84.48	112.5	103.0	126.7	189.4	37.9	65.1	82.9	100.6	E	126	43	57	N	37	21	18
323	GyeongGi	SiHeung	정왕	한일	1996.07.	580	3	2	84.48	108.9	98.2	138.5	213.1	39.1	66.3	76.9	112.5	E	126	43	26	N	37	21	29
324	GyeongGi	SiHeung	정왕	건영 1 차	1997.08.	620	3	2	84.48		99.4	137.3	177.6		61.6	82.9	100.6	E	126	44	43	N	37	20	23
325	GyeongGi	AnSan	본오	신안	1993.07.	2132	3	1	84.48	124.3	113.6	163.4	272.3	67.5	88.8	112.5	121.3	E	126	51	54	N	37	17	42
326	GyeongGi	AnSan	본오	태영고층	1991.07.	372	3	2	84.81	149.7	129.7	191.0	312.5	75.5	79.0	97.9	147.4	E	126	51	41	N	37	17	51
327	GyeongGi	AnSan	사	선경	1994.07.	550	3	2	84.81	149.7	129.7	191.0	277.1	79.0	84.9	106.1	127.3	E	126	51	1	N	37	17	30
328	GyeongGi	AnSan	사	현대 2 차	1995.02.	520	3	2	84.81	142.7	129.7	188.7	283.0	73.1	84.9	88.4	165.1	E	126	51	17	N	37	17	29
329	GyeongGi	AnSan	선부	공작한양고층	1992.05.	1470	3	2	84.48	138.5	112.5	174.0	266.3	71.0	79.3	106.5	139.1	E	126	48	44	N	37	20	23
330	GyeongGi	AnSan	성포	선경	1990.12.	1768	3	2	84.81	139.1	128.5	188.7	238.8	73.1	90.8	106.1	120.9	E	126	50	34	N	37	19	32
331	GyeongGi	AnSan	월피	현대 2 차	1990.11.	360	3	1	84.48	124.3	108.9	162.2	224.9	75.8	91.1	94.7	118.4	E	126	50	59	N	37	19	51
332	GyeongGi	AnSeong	금산	삼부	1994.04.	400	3	2	84.48		103.0	103.0	124.3		67.5	59.2	88.8	E	127	16	10	N	37	0	44
333	GyeongGi	AnSeong	낙원	서광	1995.01.	146	3	2	84.48		97.1	105.4	130.2		47.3	59.2	76.9	E	127	16	24	N	37	0	16
334	GyeongGi	AnSeong	당왕	쌍용	1994.01.	360	3	2	84.81		97.9	120.3	153.3		53.1	64.9	88.4	E	127	15	52	N	37	0	56
335	GyeongGi	AnSeong	숭인	동신	1995.10.	496	3	2	84.81		106.1	129.7	159.2		49.5	70.7	94.3	E	127	16	31	N	37	0	43
336	GyeongGi	AnSeong	당왕	대우 1 차	1993.11.	762	3	2	84.48	94.7	103.0	124.3	153.9	49.7	53.3	71.0	88.8	E	127	15	19	N	37	0	52
337	GyeongGi	AnYang	호계	샘대우	1994.01.	536	3	2	84.81	229.9	208.7	312.5	577.8	100.2	129.7	141.5	212.2	E	126	57	51	N	37	22	33
338	GyeongGi	AnYang	관양	현대	1985.04.	904	3	1	84.48	197.7	171.6	284.1	532.7	97.1	118.4	142.0	189.4	E	126	57	26	N	37	24	24
339	GyeongGi	AnYang	평촌	꿈라이프	1993.02.	548	3	2	84.81	226.4	208.7	320.7	678.0	106.1	123.8	176.9	259.4	E	126	58	4	N	37	23	11
340	GyeongGi	AnYang	박달	금호	1996.10.	752	3	2	84.48	171.6	142.0	224.9	307.8	85.2	91.1	112.5	115.4	E	126	54	5	N	37	23	56
341	GyeongGi	AnYang	관양	한가람삼성	1995.03.	708	3	2	84.48	219.0	215.4	307.8	562.3	97.1	126.7	159.8	219.0	E	126	57	20	N	37	23	59
342	GyeongGi	AnYang	비산	관악부영 4 차	1993.10.	796	3	2	84.81	209.3	186.3	288.9	542.4	97.3	114.4	141.5	194.6	E	126	56	42	N	37	23	47
343	GyeongGi	AnYang	비산	성원	1995.12.	282	3	2	84.48	177.6	150.3	183.5	372.9	85.2	97.1	100.6	148.0	E	126	57	9	N	37	24	24
344	GyeongGi	AnYang	호계	삼익	1996.10.	262	3	2	84.81	161.5	143.9	185.1	277.1	90.8	90.8	100.2	147.4	E	126	57	31	N	37	21	57
345	GyeongGi	YangJoo	덕계	신우	1994.12.	135	3	2	84.81		94.3	106.1	115.0		47.2	59.0	53.1	E	127	2	47	N	37	48	59
346	GyeongGi	YangJoo	덕정	융보	1992.11.	195	3	2	81.18		83.1	86.2	91.2		46.2	49.3	49.3	E	127	3	47	N	37	50	11
347	GyeongGi	YangJoo	백석	세아 1 차	1993.09.	282	3	2	84.15		68.3	70.1	68.3		38.6	35.7	37.4	E	126	59	26	N	37	47	48
348	GyeongGi	YangJoo	고읍	현대	1999.12.	293	3	2	84.81		94.3	123.8	141.5		47.2	59.0	64.9	E	127	4	45	N	37	48	7
349	GyeongGi	YangPyung	양서	훼미리	1992	115	3	2	84.48		94.7	106.5	97.7		40.2	53.3	49.1	E	127	19	6	N	37	32	45
350	GyeongGi	OSan	갈곶	우방	1999.04.	386	3	2	84.81		103.8	179.2	186.3		61.3	94.3	97.3	E	127	4	7	N	37	8	1
351	GyeongGi	OSan	수청	대우	1994.01.	1144	3	2	91.74		92.7	163.5	147.2		49.1	76.3	84.5	E	127	3	45	N	37	9	54
352	GyeongGi	OSan	서	신동아 2 차	1999.11.	844	3	2	84.48		94.7	150.3	171.6		48.5	76.9	84.6	E	127	2	45	N	37	8	35
353	GyeongGi	OSan	서	신동아 1 차	1995.08.	498	3	2	84.48		80.5	114.8	137.3		39.1	59.2	68.7	E	127	2	33	N	37	8	39
354	GyeongGi	OSan	수청	삼익	1992.11.	220	3	2	84.48			138.5	127.2			65.1	68.1	E	127	4	9	N	37	9	55
355	GyeongGi	YongIn	영덕	두진	1996.10.	541	3	2	84.81	159.2	129.7	229.9	306.6	67.2	73.1	117.9	103.2	E	127	5	48	N	37	16	2
356	GyeongGi	YongIn	신갈	신갈삼익	1996.12.	296	3	2	84.81	173.3	135.6	171.0	283.0	73.1	84.9	88.4	106.1	E	127	6	22	N	37	16	41
357	GyeongGi	YongIn	김량장	현대	1995.12.	755	3	2	84.15	136.7	124.8	178.3	273.3	62.4	83.2	95.1	130.7	E	127	12	41	N	37	13	44
358	GyeongGi	YongIn	마평	라이프	1994.06.	350	3	2	84.81	108.5	84.9	94.3	112.0	67.2	59.0	64.9	76.6	E	127	12	55	N	37	13	54
359	GyeongGi	YongIn	풍덕천	한국	1995.05.	416	3	2	84.15	216.3	180.6	255.5	505.1	85.6	103.4	101.0	157.5	E	127	5	37	N	37	19	24
360	GyeongGi	YongIn	풍덕천	현대	1994.12.	1168	3	2	84.48	233.2	191.8	278.2	509.0	91.1	106.5	106.5	165.7	E	127	5	40	N	37	19	34
361	GyeongGi	YongIn	죽전	죽전벽산 1 단지	1997.08.	612	3	2	84.81	229.9	218.1	330.1	518.8	96.7	117.9	135.6	188.7	E	127	6	20	N	37	20	9
362	GyeongGi	YongIn	유방	인정프린스 2 차	1995.06.	330	3	2	84.81	123.8	106.1	126.2	228.7	67.2	61.3	76.6	91.4	E	127	12	51	N	37	15	40

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $\$/m^2$)				Rent (JeonSe*) (10 US $\$/m^2$)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
363	GyeongGi	EuiWang	삼	운양까치	1991.01.	178	3	2	81.18	107.2	101.0	129.3	215.6	64.1	64.1	86.2	107.8	E	126	57	19	N	37	19	5
364	GyeongGi	EuiWang	오전	무궁화선경	1995.01.	330	3	2	84.81	173.3	141.5	188.7	318.4	79.0	90.8	106.1	153.3	E	126	58	44	N	37	21	4
365	GyeongGi	EuiWang	왕곡	신안포은	1994.12.	342	3	2	84.81	171.0	146.2	191.0	365.5	76.6	84.9	106.1	159.2	E	126	58	45	N	37	20	40
366	GyeongGi	EuiWang	포일	인덕원삼호	1991.04.	684	3	2	84.81	206.3	176.9	271.2	642.6	90.8	102.6	129.7	206.3	E	265	85	1	N	37	23	49
367	GyeongGi	EuiJeongBoo	금오	세아	1993.01.	249	3	2	84.81		96.7	112.0	128.5		49.5	70.7	79.6	E	127	4	24	N	37	45	29
368	GyeongGi	EuiJeongBoo	녹양	동원 1 차	1995.07.	406	3	2	82.83	103.8	86.9	114.7	144.9	55.5	62.8	78.5	69.4	E	127	2	16	N	37	45	22
369	GyeongGi	EuiJeongBoo	신곡	효자벽산	1994.04.	297	3	2	84.81	147.4	108.5	134.4	150.3	74.3	73.1	82.5	85.5	E	127	3	41	N	37	44	27
370	GyeongGi	EuiJeongBoo	용현	동문	1991.08.	160	3	1	78	105.1	83.3	106.4	103.2	57.7	52.6	70.5	60.3	E	127	5	8	N	37	43	51
371	GyeongGi	EuiJeongBoo	장암	우성	1992.12.	510	3	2	84.81	149.7	117.9	143.9	179.8	67.2	77.8	82.5	106.1	E	127	3	41	N	37	43	28
372	GyeongGi	EuiJeongBoo	호원	건영	1993.03.	900	3	2	84.81	149.7	128.5	176.9	212.2	69.6	73.1	94.3	117.9	E	127	3	0	N	37	42	22
373	GyeongGi	ECheon	갈산	현대 2 차	1991.01	194	3	2	84.48		100.6	106.5	136.1		66.3	61.6	88.8	E	127	27	14	N	37	16	58
374	GyeongGi	ECheon	부발	삼익	1998.01.	493	3	2	84.81	92.6	97.9	141.5	181.6	33.6	61.3	64.9	103.2	E	127	28	38	N	37	15	32
375	GyeongGi	ECheon	장호원	동양	1992	154	3	2	81.84		75.8	81.9	84.3		36.7	36.7	42.2	E	127	36	57	N	37	6	51
376	GyeongGi	ECheon	증포	선경	1997.01.	238	3	2	84.48		108.9	148.0	170.5		67.5	82.9	100.6	E	127	27	12	N	37	17	34
377	GyeongGi	PaJoo	검산	성원	2000.04.	656	3	2	84.48		119.6	144.4	180.5		59.2	59.2	71.0	E	126	45	37	N	37	46	18
378	GyeongGi	PaJoo	금능	흰돌마을장안 6 차	1999.10.	498	3	2	82.17		142.4	163.1	240.4		73.0	73.0	103.4	E	126	47	1	N	37	45	19
379	GyeongGi	PaJoo	금촌	동문 1 차	1993.01.	244	3	2	84.81		93.1	117.9	117.9		47.2	64.9	61.9	E	126	46	17	N	37	46	18
380	GyeongGi	PaJoo	조리	동문 1 차	1996.11.	118	3	2	84.81		117.9	132.1	168.0		61.3	64.9	67.8	E	126	48	28	N	37	44	30
381	GyeongGi	PyungTaek	독곡	삼익 2 차	1994.01.	364	3	2	84.48		74.6	148.0	121.3		41.4	82.9	74.0	E	127	3	49	N	37	5	6
382	GyeongGi	PyungTaek	동삭	현대동삭	1992.09	612	3	2	84.81	83.7	69.6	138.0	112.0	42.4	36.6	62.5	67.8	E	127	5	54	N	37	1	8
383	GyeongGi	PyungTaek	비전	벽산늘푸른	1994.06.	368	3	2	84.48	118.4	113.6	162.2	174.6	73.4	71.0	100.6	127.2	E	127	7	11	N	36	59	30
384	GyeongGi	PyungTaek	비전	동아백합	1994.01.	148	3	2	84.81	117.9	106.1	126.2	147.4	73.1	73.1	82.5	109.1	E	127	6	34	N	36	59	27
385	GyeongGi	PyungTaek	세교	우성꿈그린	1995.11.	580	3	2	84.81	114.4	97.9	165.1	168.0	64.9	67.2	94.3	123.8	E	127	4	48	N	37	0	7
386	GyeongGi	PyungTaek	안중	동환	1995.01.	150	3	2	84.81	0.0	0.0	93.1	96.1	0.0	0.0	50.1	56.0	E	126	55	16	N	36	59	11
387	GyeongGi	PyungTaek	통복	삼성	1993.05.	624	3	2	84.48	88.8	80.5	136.1	129.0	54.5	53.3	71.0	88.8	E	127	4	46	N	36	59	30
388	GyeongGi	PoCheon	소흘	원일 1 차	1993.05.	318	3	2	81.84			97.8	103.9			55.0	55.0	E	127	8	32	N	37	49	35
389	GyeongGi	PoCheon	소흘	우정 1 차	1997.01.	908	3	2	84.81		90.8	102.6	106.1		48.3	59.0	53.1	E	127	8	19	N	37	49	33
390	GyeongGi	HaNam	덕풍	현대	1995.11.	555	3	2	84.48	195.3	159.8	254.5	316.6	79.3	91.1	136.1	130.2	E	127	12	2	N	37	31	58
391	GyeongGi	HaNam	덕풍	서해	1996.04.	423	3	2	84.48	203.6	171.6	260.4	355.1	85.2	103.0	142.0	153.9	E	127	11	50	N	37	32	35
392	GyeongGi	HaNam	신장	동일	1999.09.	438	3	2	84.48		189.4	307.8	420.2	0.0	108.9	153.9	171.6	E	127	13	11	N	37	32	28
393	GyeongGi	HaNam	창우	신안	1994.12.	1704	3	2	84.81	214.6	185.1	300.7	430.4	90.8	106.1	141.5	171.0	E	127	13	33	N	37	32	13

* see footnote 94

Table 39 Sample 4 bedroom apartment of Seoul

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $\$/m^2$)				Rent (JeonSe*) (10 US $\$/m^2$)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
1	Seoul	GangNam	대치	쌍용 2 차	1983.11	364	4	2	132	367.4	359.8	795.5	1314.4	149.2	200.8	299.2	348.5	E	127	4	15	N	37	29	53
2	Seoul	GangNam	압구정	미성 2 차	1988.07.	911	4	2	117	406.0	397.4	726.5	1141.0	209.4	222.2	333.3	320.5	E	127	1	10	N	37	31	24
3	Seoul	GangNam	도곡	역삼럭키	1993.11.	1094	4	2	125	420.0	400.0	640.0	1060.0	168.0	208.0	300.0	328.0	E	127	2	24	N	37	29	26
4	Seoul	GangNam	삼성	풍림 1 차	1998.08.	252	4	2	116	288.8	340.5	573.3	732.8	116.4	206.9	288.8	310.3	E	127	3	42	N	37	30	56
5	Seoul	GangNam	수서	한아름	1993.11.	498	4	2	130	334.6	328.8	619.2	796.2	146.2	169.2	257.7	300.0	E	127	6	13	N	37	29	21
6	Seoul	GangNam	대치	대치현대	1999.06.	630	4	2	114		504.4	802.6	1206.1		280.7	412.3	460.5	E	127	3	39	N	37	30	3
7	Seoul	GangNam	도곡	한신	1988.05.	421	4	2	112	375.0	370.5	638.4	1026.8	169.6	214.3	290.2	370.5	E	127	2	27	N	37	29	14
8	Seoul	GangNam	논현	논현경남	1996.09.	60	4	2	114		342.1	513.2	530.7		171.1	206.1	250.0	E	127	2	17	N	37	30	38
9	Seoul	GangNam	논현	신동아	1997.07.	644	4	2	115	413.0	373.9	517.4	847.8	160.9	191.3	269.6	326.1	E	127	1	21	N	37	30	53
10	Seoul	GangNam	청담	삼성청담공원	1999.08.	391	4	2	115		473.9	673.9	934.8		221.7	326.1	317.4	E	127	3	1	N	37	31	20
11	Seoul	GangNam	일원	목련타운	1993.12.	650	4	2	135	448.1	463.0	777.8	1222.2	163.0	229.6	322.2	363.0	E	127	5	6	N	37	29	5

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
12	Seoul	GangDong	둔촌	중앙하이츠	1995.12.	232	4	2	115	273.9	256.5	354.3	391.3	119.6	134.8	182.6	221.7	E	127	8	32	N	37	31	46
13	Seoul	GangDong	둔촌	신성미소지움 1 차	1998.4.	461	4	2	115	256.5	304.3	417.4	547.8	73.9	160.9	226.1	217.4	E	127	8	34	N	37	31	40
14	Seoul	GangDong	명일	고덕삼환	1987.06.	120	4	2	122	233.6	225.4	401.6	561.5	104.5	135.2	209.0	245.9	E	127	9	7	N	37	32	58
15	Seoul	GangDong	천호	삼익	1997.09.	150	4	2	114	210.5	232.5	307.0	372.8	83.3	114.0	153.5	179.8	E	127	7	43	N	37	32	55
16	Seoul	GangDong	성내	삼성 2 단지	1999.09.	436	4	2	115		352.2	517.4	691.3		182.6	239.1	269.6	E	127	7	33	N	37	31	50
17	Seoul	GangDong	암사	중앙하이츠	1998.05.	126	4	2	116	163.8	168.1	267.2	280.2	56.0	88.4	155.2	155.2	E	127	7	55	N	37	33	5
18	Seoul	GangBook	미아	SK 북한산시티	2001.12.	5327	4	2	115		226.1	278.3	400.0		108.7	113.0	147.8	E	127	0	45	N	37	37	6
19	Seoul	GangBook	번	동문	1998.08.	167	4	2	134	149.3	153.0	205.2	223.9	63.4	78.4	108.2	108.2	E	127	2	17	N	37	37	26
20	Seoul	GangBook	번	완성	1994.12.	54	4	2	130	107.7	115.4	180.8	176.9	57.7	73.1	96.2	96.2	E	127	2	13	N	37	37	30
21	Seoul	GangBook	수유	수유벽산	1992.10.	1454	4	2	123	201.2	162.6	223.6	292.7	101.6	97.6	126.0	130.1	E	127	1	8	N	37	38	35
22	Seoul	GangBook	수유	극동	1990.10.	574	4	2	134	222.0	171.6	209.0	253.7	78.4	82.1	115.7	134.3	E	127	0	43	N	37	38	30
23	Seoul	GangBook	수유	삼성래미안	2000.04.	690	4	2	115		243.5	293.5	360.9		126.1	171.7	169.6	E	127	1	5	N	37	38	41
24	Seoul	GangSeo	가양	현대 2 차	2001.08.	114	4	2	115		247.8	347.8	543.5		165.2	147.8	147.8	E	126	51	20	N	37	33	41
25	Seoul	GangSeo	등촌	대림	1995.07.	680	4	2	124	306.5	270.2	419.4	633.1	100.8	143.1	173.4	201.6	E	126	50	47	N	37	33	44
26	Seoul	GangSeo	등촌	태영	1998.06.	186	4	2	115	226.1	213.0	293.5	426.1	78.3	100.0	154.3	156.5	E	126	51	50	N	37	33	21
27	Seoul	GangSeo	마곡	신안	1993.12.	253	4	2	108	182.9	150.5	263.9	435.2	78.7	71.8	106.5	111.1	E	126	49	26	N	37	34	4
28	Seoul	GangSeo	방화	현대 2 차	1999.12.	202	4	2	114		203.9	298.2	368.4		103.1	136.0	149.1	E	126	49	10	N	37	34	23
29	Seoul	GangSeo	염창	동아	1997.10.	778	4	2	115	243.5	226.1	321.7	500.0	80.4	119.6	139.1	160.9	E	126	52	22	N	37	33	16
30	Seoul	GangSeo	화곡	대림	1992.08.	416	4	2	110	218.2	200.0	263.6	377.3	118.2	118.2	154.5	172.7	E	126	50	13	N	37	31	59
31	Seoul	GwanAk	봉천	관악현대	1991.11.	2134	4	2	123	239.8	207.3	268.3	500.0	109.8	109.8	150.4	170.7	E	126	57	36	N	37	29	33
32	Seoul	GwanAk	봉천	낙성현대 1 차	1988.05.	251	4	2	136	220.6	220.6	297.8	334.6	95.6	110.3	161.8	161.8	E	126	57	56	N	37	28	22
33	Seoul	GwanAk	신림	신림현대	1993.05.	1634	4	2	119	254.2	214.3	271.0	458.0	113.4	113.4	157.6	176.5	E	126	55	57	N	37	28	30
34	Seoul	GwanAk	신림	동부	1994.12.	592	4	2	114	271.9	245.6	344.3	469.3	114.0	136.0	188.6	188.6	E	126	55	45	N	37	28	50
35	Seoul	GwanAk	신림	현대 2 차	1996.12.	112	4	2	113		230.1	269.9	298.7		132.7	146.0	172.6	E	126	54	32	N	37	29	4
36	Seoul	GwanAk	신림	건영 5 차	1994.03.	77	4	2	115		234.8	287.0	304.3		100.0	169.6	169.6	E	126	56	30	N	37	28	5
37	Seoul	GwanAk	신림	우방	1999.11.	201	4	2	115		210.9	317.4	347.8		130.4	160.9	156.5	E	126	55	8	N	37	29	20
38	Seoul	GwanAk	신림	쌍용	1998.01.	373	4	2	115	200.0	210.9	278.3	347.8	91.3	104.3	139.1	147.8	E	126	54	42	N	37	28	20
39	Seoul	GwangJin	광장	극동 1 차	1985.08.	448	4	2	127	326.8	299.2	551.2	866.1	149.6	161.4	228.3	287.4	E	127	6	14	N	37	32	35
40	Seoul	GwangJin	군자	일성파크	1996.01.	357	4	2	115		287.0	308.7	395.7		134.8	165.2	156.5	E	127	4	21	N	37	33	4
41	Seoul	GwangJin	자양	대동	1998.06.	314	4	2	114	271.9	289.5	394.7	675.4	109.6	144.7	184.2	245.6	E	127	4	6	N	37	32	11
42	Seoul	GwangJin	중곡	선경	1999.09.	182	4	2	113		252.2	323.0	402.7		154.9	199.1	230.1	E	127	5	11	N	37	34	8
43	Seoul	GwangJin	자양	현대 6 차	1999.02.	178	4	2	115		300.0	526.1	695.7		152.2	234.8	265.2	E	127	4	18	N	37	31	58
44	Seoul	GooRo	개봉	삼환	1995.11.	783	4	2	114	188.6	153.5	221.5	289.5	87.7	87.7	114.0	131.6	E	126	51	16	N	37	29	40
45	Seoul	GooRo	고척	청구	1998.09.	448	4	2	114	166.7	193.0	258.8	359.6	59.2	92.1	127.2	127.2	E	126	51	50	N	37	30	5
46	Seoul	GooRo	개봉	두산	1997.04.	561	4	2	111	157.7	159.9	214.0	288.3	67.6	87.8	117.1	121.6	E	126	51	10	N	37	29	42
47	Seoul	GooRo	구로	구일우성	1998.01.	829	4	2	114	182.0	188.6	267.5	372.8	72.4	109.6	136.0	188.6	E	126	52	37	N	37	29	25
48	Seoul	GooRo	신도림	동아 1 차	1999.11.	1095	4	2	148		219.6	314.2	493.2		111.5	128.4	138.5	E	126	52	59	N	37	30	39
49	Seoul	GooRo	오류	동부	1996.08.	252	4	2	115	165.2	156.5	200.0	250.0	60.9	80.4	117.4	128.3	E	126	50	52	N	37	29	49
50	Seoul	GeumCheon	가산	두산	1997.12.	1495	4	2	135	187.0	187.0	244.4	377.8	51.9	92.6	125.9	161.1	E	126	53	33	N	37	28	28
51	Seoul	GeumCheon	독산	한신	1990.12.	1000	4	2	130	207.7	173.1	284.6	396.2	80.8	96.2	115.4	157.7	E	126	53	22	N	37	27	19
52	Seoul	GeumCheon	독산	태영	2001.04.	90	4	2	111		252.3	238.7	232.0		108.1	153.2	135.1	E	126	53	29	N	37	27	58
53	Seoul	GeumCheon	시흥	벽산타운 1 단지	1997.11.	2336	4	2	115	217.4	187.0	256.5	343.5	62.2	100.0	113.0	139.1	E	126	55	10	N	37	27	4
54	Seoul	GeumCheon	시흥	금강	2000.09.	185	4	2	115		193.5	243.5	278.3		104.3	126.1	134.8	E	126	54	29	N	37	27	47
55	Seoul	NoWon	공릉	삼익	1995.10.	845	4	2	115	204.3	169.6	243.5	358.7	91.3	84.8	126.1	139.1	E	127	4	55	N	37	37	36
56	Seoul	NoWon	상계	성원	1998.01.	174	4	2	115	182.6	187.0	239.1	326.1	82.6	108.7	134.8	173.9	E	127	3	57	N	37	39	37
57	Seoul	NoWon	상계	중앙하이츠	1997.10.	437	4	2	135	214.8	214.8	325.9	407.4	57.4	98.1	144.4	155.6	E	127	4	8	N	37	39	13
58	Seoul	NoWon	상계	불암대림	1999.07.	634	4	2	115		195.7	317.4	408.7		102.2	147.8	182.6	E	127	4	38	N	37	39	48
59	Seoul	NoWon	월계	대우	1998.07.	344	4	2	135	218.5	214.8	266.7	366.7	85.2	92.6	140.7	140.7	E	127	3	5	N	37	37	59
60	Seoul	NoWon	중계	성원	1996.02.	402	4	2	135	218.5	203.7	425.9	463.0	77.8	94.8	177.8	237.0	E	127	4	11	N	37	39	0
61	Seoul	NoWon	중계	경남	1989.07.	660	4	2	114	214.9	179.8	285.1	460.5	92.1	114.0	149.1	193.0	E	127	3	45	N	37	38	21
62	Seoul	NoWon	하계	학여울청구	1997.06.	1476	4	2	114	232.5	219.3	333.3	500.0	83.3	109.6	157.9	210.5	E	127	3	43	N	37	38	6
63	Seoul	DoBong	도봉	현대성우	1998.12.	190	4	2	115	169.6	180.4	247.8	326.1	65.2	87.0	121.7	121.7	E	127	2	52	N	37	40	35
64	Seoul	DoBong	방학	거성학마을	1994.12.	347	4	2	134	186.6	179.1	216.4	287.3	82.1	93.3	130.6	156.7	E	127	2	22	N	37	39	60
65	Seoul	DoBong	방학	신동아 2 단지	1991.09.	660	4	2	120	233.3	216.7	258.3	312.5	100.0	110.4	120.8	133.3	E	127	1	34	N	37	39	37
66	Seoul	DoBong	방학	신동아 1 단지	1987.01.	3169	4	2	127	220.5	185.0	248.0	250.0	106.3	104.3	133.9	129.9	E	127	1	49	N	37	39	39
67	Seoul	DoBong	창	동아청솔	1997.07.	1981	4	2	135	274.1	229.6	325.9	474.1	96.3	103.7	140.7	170.4	E	127	2	54	N	37	39	25
68	Seoul	DoBong	창	쌍용	1997.02.	1352	4	2	135	227.4	233.3	303.7	444.4	100.0	111.1	144.4	159.3	E	127	2	53	N	37	39	35
69	Seoul	DongDaeMoon	답십리	동아	1999.07.	1233	4	2	115		208.7	273.9	360.9		117.4	152.2	147.8	E	127	3	41	N	37	34	10
70	Seoul	DongDaeMoon	답십리	대우	2000.12.	427	4	2	115		201.7	308.7	356.5		108.7	156.5	160.9	E	127	3	12	N	37	34	24
71	Seoul	DongDaeMoon	청량리	현대	1987.09.	241	4	2	124	213.7	191.5	241.9	262.1	100.8	102.8	121.0	112.9	E	127	2	47	N	37	35	4

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
72	Seoul	DongDaeMoon	이문	삼익	1997.08.	353	4	2	115	187.0	173.9	256.5	256.5	73.9	91.3	134.8	134.8	E	127	4	33	N	37	35	45
73	Seoul	DongDaeMoon	전농	우성	1991.07.	1234	4	2	127	204.7	169.3	214.6	283.5	98.4	82.7	114.2	118.1	E	127	3	54	N	37	34	38
74	Seoul	DongDaeMoon	휘경	롯데	2000.09.	265	4	2	115		213.0	278.3	291.3		117.4	143.5	152.2	E	127	3	48	N	37	35	28
75	Seoul	DongJak	노량진	우성	1995.11.	901	4	2	125	264.0	218.0	284.0	492.0	92.0	108.0	156.0	196.0	E	126	56	52	N	37	30	34
76	Seoul	DongJak	대방	대림	1993.10.	1628	4	2	134	123.1	343.3	425.4	634.3	156.7	156.7	223.9	242.5	E	126	55	28	N	37	30	27
77	Seoul	DongJak	본	신동아	1993.07.	765	4	2	104	223.6	211.5	278.8	495.2	120.2	120.2	132.2	168.3	E	126	57	6	N	37	30	36
78	Seoul	DongJak	사당	극동	1992.10.	1550	4	2	110	250.0	245.5	345.5	527.3	113.6	127.3	168.2	204.5	E	126	58	29	N	37	29	26
79	Seoul	DongJak	노량진	상도건영	1997.08.	824	4	2	115	282.6	247.8	330.4	543.5	95.7	126.1	169.6	213.0	E	126	56	58	N	37	30	27
80	Seoul	DongJak	신대방	한성	1994.12.	272	4	2	130	250.0	230.8	330.8	507.7	111.5	123.1	169.2	200.0	E	126	54	55	N	37	29	44
81	Seoul	Mapo	도화	삼성	1994.07.	982	4	2	115	360.9	313.0	426.1	691.3	152.2	165.2	208.7	256.5	E	126	57	1	N	37	32	24
82	Seoul	Mapo	도화	우성	1991.03.	1230	4	2	128	285.2	226.6	347.7	507.8	121.1	121.1	168.0	160.2	E	126	56	54	N	37	32	10
83	Seoul	Mapo	도화	현대 1 차	1993.08.	1021	4	2	128	275.4	230.5	316.4	539.1	105.5	113.3	156.3	171.9	E	126	57	14	N	37	32	22
84	Seoul	Mapo	신수	삼익	1996.11.	391	4	2	114	271.9	271.9	355.3	429.8	118.4	136.0	197.4	219.3	E	126	56	8	N	37	33	4
85	Seoul	Mapo	연남	대명	1996.01.	128	4	2	112		223.2	276.8	357.1		138.4	183.0	178.6	E	126	55	25	N	37	33	42
86	Seoul	Mapo	중	현대 1 차	2000.04.	477	4	2	115		245.7	356.5	402.2		113.0	173.9	184.8	E	126	54	25	N	37	34	16
87	Seoul	SeoDaeMoon	북가좌	한양	1986.12.	660	4	2	117	213.7	192.3	260.7	326.9	106.8	102.6	136.8	128.2	E	126	54	32	N	37	34	33
88	Seoul	SeoDaeMoon	연희	대림	1993.01.	220	4	2	119	285.7	247.9	327.7	365.5	113.4	142.9	180.7	218.5	E	126	56	10	N	37	34	31
89	Seoul	SeoDaeMoon	영천	독립문삼호	1995.06.	895	4	2	114	267.5	267.5	394.7	561.4	92.1	157.9	214.9	254.4	E	126	57	30	N	37	34	11
90	Seoul	SeoDaeMoon	남가좌	현대	1998.10.	1485	4	2	115	187.0	230.4	319.6	426.1	67.4	117.4	169.6	178.3	E	126	55	14	N	37	34	28
91	Seoul	SeoDaeMoon	홍은	벽산	1995.04.	1509	4	2	115	239.1	204.3	287.0	352.2	100.0	117.4	152.2	160.9	E	126	56	41	N	37	35	41
92	Seoul	SeoDaeMoon	홍은	풍림 2 차	1989.09.	390	4	2	107	219.6	182.2	233.6	280.4	98.1	107.5	135.5	163.6	E	126	56	34	N	37	35	35
93	Seoul	SeoDaeMoon	홍제	한양	1992.07.	998	4	2	122	252.0	233.6	332.0	409.8	90.2	108.6	176.2	180.3	E	126	56	49	N	37	34	59
94	Seoul	SeoDaeMoon	홍제	홍제현대	1992.01.	704	4	2	119	273.1	231.1	310.9	399.2	79.8	130.3	172.3	176.5	E	126	56	28	N	37	35	20
95	Seoul	SeoCho	반포	새서울	1994.07.	154	4	2	130	376.9	357.7	519.2	611.5	176.9	207.7	242.3	269.2	E	127	0	36	N	37	29	57
96	Seoul	SeoCho	반포	한신서래	1988.01.	414	4	2	118	334.7	305.1	512.7	741.5	156.8	161.0	233.1	309.3	E	127	2	3	N	37	29	57
97	Seoul	SeoCho	방배	삼호한숲	1998.10.	116	4	2	114	328.9	394.7	557.0	728.1	166.7	223.7	293.9	298.2	E	126	59	56	N	37	28	40
98	Seoul	SeoCho	방배	우성	1990.12.	468	4	2	117		290.6	517.1	782.1		162.4	230.8	273.5	E	126	58	58	N	37	28	27
99	Seoul	SeoCho	서초	서초현대	1999.12.	299	4	2	115		495.7	634.8	847.8		256.5	313.0	313.0	E	127	1	13	N	37	29	27
100	Seoul	SeoCho	서초	우성 5 차	1996.05.	408	4	2	135	444.4	483.3	622.2	922.2	166.7	250.0	248.1	300.0	E	127	1	36	N	37	29	40
101	Seoul	SeoCho	우면	대림	1995.03.	412	4	2	131	458.0	454.2	667.9	954.2	160.3	213.7	278.6	313.0	E	127	1	22	N	37	28	22
102	Seoul	SeoCho	잠원	한신타워	1996.04.	250	4	2	131	423.7	438.9	477.1	1007.6	183.2	209.9	248.1	324.4	E	127	0	22	N	37	30	39
103	Seoul	SeongDong	금호	두산	1993.12.	1267	4	2	125	272.0	244.0	352.0	748.0	128.0	124.0	176.0	260.0	E	127	0	58	N	37	32	59
104	Seoul	SeongDong	성수	동아그린	1998.09.	331	4	2	112		250.0	343.8	531.3		138.4	160.7	200.9	E	127	2	54	N	37	33	3
105	Seoul	SeongDong	옥수	극동그린	1996.06.	583	4	2	114	359.6	333.3	434.2	561.4	166.7	162.3	197.4	250.0	E	127	0	36	N	37	32	30
106	Seoul	SeongDong	응봉	신동아	1996.04.	434	4	2	115	247.8	226.1	308.7	373.9	110.9	113.0	156.5	165.2	E	127	1	45	N	37	32	59
107	Seoul	SeongDong	하왕십리	청계벽산	1996.06.	1332	4	2	115	221.7	221.7	378.3	456.5	87.0	126.1	141.3	173.9	E	127	1	53	N	37	34	8
108	Seoul	SeongDong	행당	신동아	1995.07.	636	4	2	115	243.5	221.7	317.4	430.4	108.7	113.0	156.5	165.2	E	127	1	57	N	37	33	14
109	Seoul	SeongDong	행당	삼부	1997.11.	498	4	2	122	278.7	250.0	315.6	504.1	118.9	131.1	172.1	229.5	E	127	2	15	N	37	33	35
110	Seoul	SeongBook	길음	삼부	1992.09.	684	4	2	112	187.5	176.3	276.8	339.3	102.7	104.9	138.4	138.4	E	127	1	25	N	37	36	9
111	Seoul	SeongBook	돈암	한신	1995.06.	1795	4	2	114	302.6	258.8	298.2	443.0	116.2	127.2	179.8	175.4	E	127	0	34	N	37	35	37
112	Seoul	SeongBook	동소문	송산	1997.08.	345	4	2	115	256.5	243.5	282.6	330.4	113.0	126.1	160.9	165.2	E	127	0	38	N	37	35	33
113	Seoul	SeongBook	상월곡	우남	1994.11.	225	4	2	114	223.7	190.8	214.9	232.5	127.2	109.6	118.4	122.8	E	127	2	48	N	37	36	21
114	Seoul	SeongBook	정릉	중앙하이츠	1995.01.	261	4	2	115	252.2	230.4	247.8	239.1	117.4	121.7	121.7	126.1	E	127	0	8	N	37	37	11
115	Seoul	SeongBook	하월곡	동신	1997.07.	746	4	2	115	234.8	221.7	256.5	330.4	95.7	108.7	134.8	160.9	E	127	2	7	N	37	36	16
116	Seoul	SongPa	가락	삼환	1985.06.	648	4	2	121	243.8	252.1	524.8	690.1	99.2	128.1	177.7	177.7	E	127	8	12	N	37	29	43
117	Seoul	SongPa	문정	올림픽훼밀리	1988.12.	4494	4	2	117	329.1	320.5	649.6	1111.1	132.5	175.2	239.3	247.9	E	127	6	55	N	37	29	21
118	Seoul	SongPa	거여	우방	1999.05.	257	4	2	115		260.9	400.0	502.2		134.8	182.6	187.0	E	127	8	32	N	37	29	33
119	Seoul	SongPa	가락	우성	1986.12.	838	4	2	129	259.7	275.2	418.6	629.8	118.2	147.3	209.3	217.1	E	127	7	4	N	37	29	49
120	Seoul	SongPa	오금	대림	1989.01.	749	4	2	126	313.5	313.5	575.4	853.2	158.7	158.7	238.1	257.9	E	127	7	45	N	37	30	36
121	Seoul	SongPa	오금	우방	2000.12.	196	4	2	115		267.4	352.2	539.1		134.8	182.6	204.3	E	127	8	23	N	37	30	5
122	Seoul	SongPa	잠실	우성 4 차	1983.09.	555	4	2	106	278.3	264.2	580.2	801.9	132.1	146.2	221.7	217.0	E	127	4	58	N	37	30	10
123	Seoul	SongPa	풍납	갑을	1996.07.	85	4	2	110		231.8	311.4	400.0		129.5	190.9	193.2	E	127	6	45	N	37	32	7
124	Seoul	YangCheon	목	금호	1997.10.	224	4	2	115		291.3	443.5	817.4		152.2	221.7	282.6	E	126	52	29	N	37	31	31
125	Seoul	YangCheon	목	삼익	1997.06.	277	4	2	114	241.2	271.9	407.9	570.2	118.4	144.7	197.4	219.3	E	126	52	35	N	37	31	23
126	Seoul	YangCheon	목	성원	1997.02.	200	4	2	115	300.0	304.3	391.3	660.9	134.8	163.0	226.1	287.0	E	126	52	9	N	37	31	35
127	Seoul	YangCheon	신월	금용	2001.10.	215	4	2	114		201.8	263.2	364.0		122.8	144.7	140.4	E	126	50	33	N	37	31	15
128	Seoul	YangCheon	신정	목동현대	1996.04.	2076	4	2	115	282.6	278.3	491.3	656.5	104.3	147.8	208.7	226.1	E	126	52	37	N	37	31	13
129	Seoul	YeongDeungPo	당산	강마을삼성	1995.05.	348	4	2	115		256.5	356.5	500.0		126.1	187.0	200.0	E	126	54	21	N	37	32	3
130	Seoul	YeongDeungPo	대림	한신 1 차	1998.12.	143	4	2	114		214.9	254.4	377.2		127.2	138.2	171.1	E	126	54	14	N	37	29	41
131	Seoul	YeongDeungPo	도림	청구	1997.12.	200	4	2	127	208.7	192.9	261.8	362.2	57.1	106.3	151.6	149.6	E	126	53	44	N	37	30	33

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
132	Seoul	YeongDeungPo	신길	한성	1997.04.	420	4	2	134	287.3	287.3	347.0	410.4	93.3	130.6	160.4	175.4	E	126	55	9	N	37	30	17
133	Seoul	YeongDeungPo	양평	동보	1998.04.	184	4	2	136	172.8	176.5	235.3	397.1	55.1	99.3	114.0	143.4	E	126	53	27	N	37	32	17
134	Seoul	YeongDeungPo	여의도	미성	1978.06.	577	4	2	114	302.6	289.5	546.1	921.1	131.6	157.9	201.8	210.5	E	126	55	28	N	37	31	11
135	Seoul	YongSan	효창	한신	1987.01.	120	4	2	121	186.0	227.3	297.5	371.9	95.0	95.0	161.2	167.4	E	126	57	27	N	37	32	30
136	Seoul	YongSan	서빙고	신동아	1984.06.	1326	4	2	140	389.3	414.3	575.0	1025.0	164.3	182.1	228.6	257.1	E	126	59	16	N	37	31	5
137	Seoul	YongSan	이촌	대림	1994.05.	638	4	2	115	300.0	308.7	491.3	743.5	147.8	143.5	187.0	208.7	E	126	57	18	N	37	31	29
138	Seoul	YongSan	이촌	동아그린	1999.06.	499	4	2	115		291.3	373.9	534.8		143.5	187.0	189.1	E	126	57	29	N	37	31	26
139	Seoul	YongSan	이태원	남산대림	1994.10.	400	4	2	135	429.6	425.9	537.0	629.6	177.8	192.6	288.9	222.2	E	126	59	19	N	37	32	27
140	Seoul	EunPyung	녹번	대림	1993.09.	370	5	2	134	257.5	194.0	250.0	466.4	100.7	108.2	145.5	201.5	E	126	56	13	N	37	35	59
141	Seoul	EunPyung	불광	미성	1988.06.	1340	4	2	126	230.2	206.3	297.6	436.5	123.0	123.0	162.7	178.6	E	126	55	41	N	37	36	53
142	Seoul	EunPyung	갈현	한솔	1997.12.	193	4	2	115		204.3	243.5	247.8		108.7	147.8	152.2	E	126	54	36	N	37	37	5
143	Seoul	EunPyung	대조	삼성타운	1997.10.	357	4	2	123		235.8	300.8	341.5		134.1	166.7	215.4	E	126	55	18	N	37	36	32
144	Seoul	EunPyung	수색	청구	1998.10.	196	4	2	127		248.0	358.3	397.6		122.0	149.6	177.2	E	126	54	4	N	37	34	50
145	Seoul	EunPyung	응암	우성	1988.07.	292	4	2	115	173.9	152.2	200.0	213.0	91.3	104.3	139.1	126.1	E	126	55	5	N	37	35	2
146	Seoul	JongRo	교북	동아	1995.11.	48	4	2	99			308.1	328.3			207.1	207.1	E	126	57	43	N	37	34	17
147	Seoul	JongRo	명륜	명륜아남 3 차	1999.01.	136	4	2	115		360.9	443.5	521.7		204.3	269.6	273.9	E	127	0	0	N	37	35	8
148	Seoul	JongRo	무악	현대	1999.11.	1514	4	2	115		308.7	439.1	565.2		165.2	256.5	278.3	E	126	57	39	N	37	34	31
149	Seoul	JongRo	창신	쌍용 2 차	1993.06.	919	4	2	116	202.6	202.6	267.2	357.8	99.1	99.1	133.6	135.8	E	127	0	43	N	37	34	49
150	Seoul	JongRo	평창	롯데	2001.04.	156	4	2	110		331.8	513.6	563.6		209.1	272.7	295.5	E	126	58	32	N	37	36	33
151	Seoul	Joong	신당	현대	1990.06.	942	4	2	122	213.1	184.4	286.9	397.5	94.3	96.3	143.4	155.7	E	127	1	17	N	37	33	35
152	Seoul	Joong	신당	남산타운	2000.06.	5150	4	2	115		387.0	504.3	739.1		195.7	247.8	304.3	E	127	0	35	N	37	32	59
153	Seoul	JoongRang	면목	신성	1998.10.	266	4	2	103	174.8	174.8	235.4	257.3	58.3	92.2	131.1	126.2	E	127	4	22	N	37	30	25
154	Seoul	JoongRang	면목	삼호	1996.11.	183	4	2	113		181.4	234.5	296.5		115.0	137.2	150.4	E	127	5	20	N	37	34	35
155	Seoul	JoongRang	상봉	동부	1999.04.	368	4	2	119	176.5	189.1	285.7	390.8	92.4	102.9	128.2	149.2	E	127	5	38	N	37	36	8
156	Seoul	JoongRang	신내	동성 3 차	1995.07.	1844	4	2	130	226.9	178.8	246.2	365.4	88.5	84.6	115.4	153.8	E	127	5	45	N	37	36	29
157	Seoul	JoongRang	신내	진로	1995.11.	818	4	2	134	272.4	227.6	317.2	459.0	93.3	87.7	145.5	175.4	E	127	5	15	N	37	37	2
158	Seoul	JoongRang	묵	신안 1 차	1999.10.	285	4	2	104		278.8	298.1	379.8		120.2	158.7	168.3	E	127	4	53	N	37	36	45
159	InCheon	GangHwa	강화	그랑드빌	2000.12.	98	4	2	121		146.3	121.9	113.6		39.3	47.5	45.5	E	126	29	31	N	37	44	44
160	InCheon	GyeYang	계산	은행삼보	1997.08.	436	4	2	115	165.2	158.7	247.8	365.2	71.7	91.3	126.1	156.5	E	126	44	27	N	37	32	13
161	InCheon	GyeYang	오류	신동아	1998.09.	1192	4	2	115		121.7	195.7	252.2		52.2	78.3	73.9	E	126	44	0	N	37	34	50
162	InCheon	GyeYang	계산	현대	1992.02.	1248	4	2	135	135.2	133.3	207.4	233.3	57.4	68.5	107.4	103.7	E	126	43	58	N	37	32	14
163	InCheon	GyeYang	작전	동보 1 차	1995.10.	1187	4	2	118		120.8	197.0	237.3		67.8	110.2	97.5	E	126	44	21	N	37	31	56
164	InCheon	GyeYang	효성	현대 2 차	1992.12.	340	4	2	129	133.7	112.4	197.7	251.9	56.2	62.0	104.7	108.5	E	126	42	47	N	37	31	58
165	InCheon	Nam	관교	동아	1990.10.	390	4	2	131	141.2	124.0	190.8	232.8	64.9	72.5	114.5	129.8	E	126	41	40	N	37	26	40
166	InCheon	Nam	관교	삼환	1992.04.	352	4	2	133	139.1	133.5	208.6	229.3	69.5	71.4	116.5	127.8	E	126	41	46	N	37	26	35
167	InCheon	Nam	주안	진흥	1994.01.	828	4	2	127	122.0	128.0	192.9	198.8	55.1	74.8	110.2	114.2	E	126	40	56	N	37	26	47
168	InCheon	Nam	용현	한양 2 차	1991.09.	352	4	2	133	84.6	78.9	124.1	133.5	38.7	48.9	78.9	75.2	E	126	37	54	N	37	27	10
169	InCheon	Nam	용현	대림	1991.12.	598	4	2	128	89.8	85.9	142.6	152.3	43.0	56.6	82.0	78.1	E	126	38	11	N	37	26	56
170	InCheon	Nam	주안	쌍용	1985.12.	768	4	2	128	85.9	82.0	164.1	160.2	43.0	44.9	85.9	78.1	E	126	40	48	N	37	26	48
171	InCheon	Nam	학익	신동아 5 차	1993.06.	594	4	2	127	128.0	116.1	171.3	171.3	63.0	61.0	110.2	94.5	E	126	40	39	N	37	26	36
172	InCheon	NamDong	간석	금호	1988.10.	630	4	2	99	118.7	120.2	197.0	199.5	68.2	74.7	121.2	141.4	E	126	41	58	N	37	27	28
173	InCheon	NamDong	간석	현대	1991.9.	390	4	2	127	118.1	116.1	177.2	173.2	53.1	65.0	106.3	98.4	E	126	41	35	N	37	28	4
174	InCheon	NamDong	구월	동아	1991.09.	486	4	2	127	118.1	118.1	177.2	200.8	72.8	72.8	126.0	114.2	E	126	42	40	N	37	26	53
175	InCheon	NamDong	만수	효성상아 1 차	1985.07.	720	4	2	121	104.1	100.8	173.6	186.0	62.0	68.2	95.0	101.2	E	126	43	21	N	37	27	27
176	InCheon	NamDong	만수	신동아	1990.06.	750	4	2	118	116.5	108.5	182.2	192.8	63.6	69.9	105.9	110.2	E	126	44	13	N	37	27	59
177	InCheon	NamDong	남촌	풍림 3 차	1999.10.	735	4	2	123		130.1	195.1	199.2		65.4	101.6	101.6	E	126	42	59	N	37	25	44
178	InCheon	NamDong	서창	태창 2 차	1997.10.	577	4	2	121	105.4	121.9	210.7	239.7	41.3	64.0	103.3	119.8	E	126	45	8	N	37	26	7
179	InCheon	BooPyung	갈산	두산	1992.12.	574	4	2	132	123.1	113.6	219.7	287.9	49.2	66.3	98.5	128.8	E	126	43	40	N	37	30	39
180	InCheon	BooPyung	부개	한국	1992.07.	580	4	2	120	120.8	125.0	170.8	208.3	54.2	72.9	91.7	87.5	E	126	43	55	N	37	29	2
181	InCheon	BooPyung	부평	동아 2 차	1995.02.	2128	4	2	135	177.8	155.6	277.8	344.4	81.5	88.9	125.9	131.5	E	126	43	6	N	37	29	47
182	InCheon	BooPyung	부개	푸른마을삼부	1999.06.	680	4	2	135		163.0	277.8	355.6		81.5	111.1	135.2	E	126	44	30	N	37	30	10
183	InCheon	BooPyung	산곡	현대 5 차	1993.12.	1161	4	2	133	146.6	118.4	203.0	236.8	67.7	77.1	116.5	131.6	E	126	42	38	N	37	30	20
184	InCheon	BooPyung	산곡	우성 4 차	1993.01.	494	4	2	109	105.5	105.5	178.9	188.1	78.0	78.0	110.1	119.3	E	126	42	17	N	37	30	0
185	InCheon	BooPyung	청천	금호	1998.03.	2539	4	2	134	153.0	149.3	257.5	298.5	61.6	82.1	126.9	132.5	E	126	42	43	N	37	30	26
186	InCheon	Seo	가정	한국	1994.01.	620	4	2	127		92.5	129.9	153.5		47.2	70.9	72.8	E	126	40	39	N	37	30	50
187	InCheon	Seo	가좌	진주 5 단지	1991.06.	268	4	2	136		99.3	150.7	183.8		57.0	80.9	77.2	E	126	41	8	N	37	29	30
188	InCheon	Seo	왕길	원흥	1993.07.	354	4	2	135	85.2	75.9	116.7	207.4	42.6	42.6	53.7	55.6	E	126	39	2	N	37	36	0
189	InCheon	Seo	가좌	범양	1990.07.	510	4	2	110	125.0	103.2	175.0	165.9	56.8	61.4	88.6	95.5	E	126	41	17	N	37	29	44
190	InCheon	Seo	마전	동아	1998.11.	1351	4	2	135		105.6	151.9	281.5		44.4	53.7	70.4	E	126	40	22	N	37	35	50
191	InCheon	Seo	심곡	한국 2 차	1995.04.	392	4	2	130	107.7	96.2	173.1	188.5	42.3	51.9	75.0	73.1	E	126	40	42	N	37	32	36

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
192	InCheon	Seo	연희	한국 1 차	1994.10.	356	4	2	130	111.5	101.9	161.5	207.7	53.8	51.9	65.4	96.2	E	126	40	31	N	37	33	3
193	InCheon	YeonSoo	동춘	대우삼환	1994.05.	1776	4	2	121	164.5	148.8	272.7	338.8	70.2	76.4	144.6	157.0	E	126	40	42	N	37	24	19
194	InCheon	YeonSoo	동춘	현대대림	1993.08.	700	4	2	134	175.4	149.3	279.9	306.0	72.8	69.0	130.6	141.8	E	126	40	24	N	37	24	31
195	InCheon	YeonSoo	선학	뉴서울	1992.10.	720	4	2	127	126.0	124.0	189.0	206.7	57.1	65.0	122.0	110.2	E	126	42	0	N	37	25	30
196	InCheon	YeonSoo	선학	금호	1993.01.	540	4	2	124	153.2	131.0	225.8	241.9	62.5	66.5	121.0	121.0	E	126	42	0	N	37	25	35
197	InCheon	YeonSoo	연수	동남	1994.03.	420	4	2	122	143.4	118.9	209.0	258.2	55.3	69.7	106.6	110.7	E	126	40	30	N	37	25	26
198	InCheon	YeonSoo	연수	대우 1 차	1992.06.	390	4	2	128	113.3	111.3	203.1	253.9	52.7	56.6	109.4	128.9	E	126	41	14	N	37	25	3
199	InCheon	YeonSoo	옥련	우성	1996.01.	498	4	2	125	124.0	124.0	188.0	244.0	48.0	66.0	104.0	108.0	E	126	38	50	N	37	25	25
200	InCheon	YeonSoo	청학	현대	2000.06.	420	4	2	139		136.7	226.6	230.2		73.7	125.9	133.1	E	126	40	11	N	37	25	44
201	InCheon	YeonSoo	옥련	쌍용	1998.08.	574	4	2	124	127.0	155.2	229.8	241.9	46.4	74.6	104.8	112.9	E	126	39	12	N	37	25	30
202	GyeongGi	GoYang	고양	화성그린빌	1998.06.	122	4	2	124	121.0	125.0	157.3	217.7	36.3	60.5	76.6	84.7	E	126	53	56	N	37	42	13
203	GyeongGi	GoYang	대화	장성건영	1996.02.	354	4	2	134	209.0	197.8	298.5	578.4	63.4	79.1	106.3	141.8	E	126	44	46	N	37	40	21
204	GyeongGi	GoYang	대화	장성대명	1995.11.	162	4	2	130	200.0	175.0	269.2	519.2	65.4	80.8	113.5	123.1	E	126	44	38	N	37	40	22
205	GyeongGi	GoYang	마두	강촌우방	1993.03.	766	4	2	132	227.3	231.1	340.9	674.2	66.3	109.8	147.7	208.3	E	126	46	52	N	37	39	20
206	GyeongGi	GoYang	마두	백마벽산	1994.08.	438	4	2	135	244.4	207.4	314.8	648.1	64.8	92.6	127.8	151.9	E	126	47	22	N	37	39	28
207	GyeongGi	GoYang	일산	후곡동신	1994.08.	434	4	2	117	211.5	205.1	324.8	611.1	70.5	91.9	141.0	149.6	E	126	45	43	N	37	40	44
208	GyeongGi	GoYang	중산	중산마을 12 단지현대	1996.05.	110	4	2	131	221.4	187.0	194.7	416.0	63.0	72.5	95.4	99.2	E	126	46	54	N	37	41	14
209	GyeongGi	GoYang	성사	신원당동신	1992.11.	885	4	2	135	170.4	140.7	218.5	388.9	61.1	72.2	100.0	140.7	E	126	50	16	N	37	39	6
210	GyeongGi	GoYang	성사	신원당삼보	1992.10.	480	4	2	114	131.6	155.7	206.1	403.5	65.8	81.1	114.0	133.8	E	126	50	8	N	37	39	13
211	GyeongGi	GoYang	중산	중산마을 9 단지두산	1996.02.	240	4	2	134	181.0	143.7	195.9	395.5	52.2	63.4	93.3	104.5	E	126	46	47	N	37	41	22
212	GyeongGi	GoYang	일산	동문 2 차	1997.11.	667	4	2	134		145.5	182.8	347.0		63.4	82.1	82.1	E	126	45	51	N	37	41	9
213	GyeongGi	GoYang	일산	에이스	1994.12.	332	4	2	131	152.7	122.1	141.2	271.0	50.8	58.4	91.6	91.6	E	126	46	35	N	37	41	16
214	GyeongGi	GoYang	장항	호수유원	1994.05.	440	4	2	132	231.1	223.5	303.0	602.3	68.2	89.0	136.4	170.5	E	126	46	32	N	37	38	51
215	GyeongGi	GoYang	주엽	강선건영	1994.01.	264	4	2	132	227.3	219.7	310.6	560.6	66.3	90.9	121.2	151.5	E	126	46	4	N	37	40	18
216	GyeongGi	GoYang	주엽	강선우성	1994.03.	412	4	2	125	234.0	228.0	340.0	720.0	74.0	98.0	140.0	168.0	E	126	45	39	N	37	39	57
217	GyeongGi	GoYang	탄현	탄현동성	1994.11.	652	4	2	122	192.6	155.7	209.0	405.7	55.3	67.6	90.2	102.5	E	126	46	2	N	37	41	55
218	GyeongGi	GoYang	행신	무원신안	1995.12.	328	4	2	135	185.2	153.7	225.9	414.8	61.1	75.9	101.9	137.0	E	126	49	54	N	37	36	53
219	GyeongGi	GoYang	행신	햇빛동신	1997.08.	458	4	2	135	151.9	168.5	248.1	455.6	51.9	77.8	107.4	155.6	E	126	50	29	N	37	37	17
220	GyeongGi	GoYang	화정	은빛 LG	1995.11.	384	4	2	135	218.5	181.5	266.7	474.1	61.1	85.2	127.8	144.4	E	126	50	8	N	37	38	31
221	GyeongGi	GoYang	화정	달빛현대	1995.08.	300	4	2	134	220.1	179.1	259.3	466.4	59.7	87.7	115.7	145.5	E	126	49	57	N	37	38	30
222	GyeongGi	GoYang	화정	은빛부영	1996.10.	1320	4	2	133	236.8	184.2	272.6	556.4	69.5	90.2	124.1	172.9	E	126	49	46	N	37	38	11
223	GyeongGi	GwangMyung	광명	중앙하이츠 1 차	1993.07.	909	4	2	132	164.8	143.9	265.2	265.2	72.0	83.3	125.0	113.6	E	126	51	18	N	37	28	9
224	GyeongGi	GwangMyung	소하	동양 1 차	2000.05	216	4	2	130		163.5	311.5	392.3		84.6	142.3	146.2	E	126	53	11	N	37	27	20
225	GyeongGi	GwangMyung	철산	철산한신	1992.11.	1568	4	2	130	215.4	207.7	300.0	396.2	92.3	111.5	142.3	161.5	E	126	52	35	N	37	28	21
226	GyeongGi	GwangMyung	철산	주공 13 단지	1986.08.	2460	4	2	121	252.1	227.3	367.8	537.2	99.2	115.7	173.6	194.2	E	126	52	12	N	37	28	45
227	GyeongGi	GwangMyung	철산	주공도덕파크	2002.06.	2351	4	2	115			382.6	504.3			160.9	191.3	E	126	51	54	N	37	28	12
228	GyeongGi	GwangJoo	장지	현대	2000.09.	477	4	2	117		162.4	198.7	337.6		66.2	89.7	106.8	E	127	14	2	N	37	23	35
229	GyeongGi	GwangJoo	태전	성원 2 차	2000.10.	435	4	2	134		149.3	186.6	406.7		57.8	84.0	89.6	E	127	12	14	N	37	24	36
230	GyeongGi	GwangJoo	탄벌	탄벌리현대	2000.07.	545	4	2	135		160.7	183.0	307.4		76.3	92.6	96.3	E	127	12	35	N	37	25	36
231	GyeongGi	GwangJoo	실촌	쌍용 1 차	1998.11.	440	4	2	135	98.1	114.8	159.3	240.7	33.3	48.1	72.2	70.4	E	127	20	17	N	37	20	47
232	GyeongGi	GwangJoo	오포	쌍용	1999.02.	313	4	2	134		130.6	141.8	253.7		50.4	69.0	70.9	E	127	15	24	N	37	22	50
233	GyeongGi	GwangJoo	태전	성원 1 차	1999.07.	654	4	2	134		134.3	156.7	361.9		56.0	72.8	80.2	E	127	13	44	N	37	23	23
234	GyeongGi	GooRi	교문	대우동양고속	1994.11.	680	4	2	135	211.1	166.7	270.4	385.2	75.9	66.7	92.6	144.4	E	127	8	8	N	37	35	20
235	GyeongGi	GooRi	교문	구리우성	1994.08.	341	4	2	134	212.7	164.2	264.9	459.0	76.5	69.0	115.7	141.8	E	127	8	13	N	37	35	17
236	GyeongGi	GooRi	교문	덕현	1994.01.	1077	4	2	135	211.1	155.6	266.7	388.9	81.5	70.4	100.0	133.3	E	127	7	59	N	37	35	25
237	GyeongGi	GooRi	인창	성원 2 차	2000.10.	461	4	2	135		175.9	248.1	314.8		70.4	100.0	118.5	E	127	8	11	N	37	36	41
238	GyeongGi	GooRi	인창	LG	1999.06.	482	4	2	121		171.5	252.1	281.0		78.5	107.4	115.7	E	127	7	56	N	37	36	24
239	GyeongGi	GooRi	인창	삼보	1996.12.	906	4	2	115	228.3	189.1	291.3	439.1	73.9	80.4	115.2	160.9	E	127	8	26	N	37	36	25
240	GyeongGi	GoonPo	궁내	묘향롯데	1993.06.	784	4	2	134	216.4	201.5	235.1	485.1	74.6	85.8	123.1	175.4	E	126	55	16	N	37	21	45
241	GyeongGi	GoonPo	당	쌍용	1998.07.	770	4	2	125	128.0	172.0	228.0	432.0	40.0	90.0	116.0	164.0	E	126	56	32	N	37	20	41
242	GyeongGi	GoonPo	당	동아	1993.01.	482	4	2	120		141.7	177.1	313.8		83.3	95.8	129.2	E	126	56	48	N	37	20	58
243	GyeongGi	GoonPo	금정	무궁화화성	1993.05.	402	4	2	135	185.2	150.0	214.8	433.3	70.4	81.5	114.8	163.0	E	126	56	10	N	37	21	31
244	GyeongGi	GimPo	감정	쌍용	1998.07.	586	4	2	115	121.7	132.6	191.3	247.8	37.0	58.7	71.7	82.6	E	126	41	53	N	37	37	30
245	GyeongGi	GimPo	감정	효성	1996.07.	242	4	2	126	154.8	103.2	170.6	257.9	57.5	51.6	67.5	73.4	E	126	42	5	N	37	37	36
246	GyeongGi	GimPo	고촌	길훈 1 차	1991.12.	163	4	2	114	140.4	116.2	214.9	168.9	63.6	65.8	78.9	74.6	E	126	46	11	N	37	36	16
247	GyeongGi	GimPo	풍무	길훈 1 차	1993.01.	219	4	2	137		98.5	127.7	149.6		42.0	56.6	51.1	E	126	43	9	N	37	36	47
248	GyeongGi	NamYangJoo	별내	주공 5 단지	2000.09.	592	4	2	118		152.5	190.7	266.9		72.0	91.1	97.5	E	127	7	16	N	37	42	27
249	GyeongGi	NamYangJoo	오남	오남청구	2000.10.	429	4	2	119		100.8	130.3	155.5		39.9	54.6	58.8	E	127	11	56	N	37	41	58
250	GyeongGi	NamYangJoo	와부	현대	1997.12.	982	4	2	134	164.2	179.1	201.5	384.3	39.2	61.6	78.4	115.7	E	127	12	51	N	37	34	52
251	GyeongGi	NamYangJoo	진건	화성타운	1999.04.	249	4	2	122		116.8	147.5	149.6		53.3	61.5	63.5	E	127	10	26	N	37	39	32

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/$m^2$)				Rent (JeonSe*) (10 US $/$m^2$)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
252	GyeongGi	NamYangJoo	진접	한신	1999.03.	395	4	2	120		104.2	127.1	154.2		50.0	62.5	62.5	E	127	10	1	N	37	42	29
253	GyeongGi	NamYangJoo	퇴계원	극동	1999.03.	498	4	2	115		134.8	187.0	243.5		58.7	95.7	95.7	E	127	8	19	N	37	38	55
254	GyeongGi	NamYangJoo	화도	경향	1997.12.	312	4	2	115	100.0	100.0	147.8	187.0	37.0	50.0	69.6	65.2	E	127	18	5	N	37	38	48
255	GyeongGi	NamYangJoo	화도	창현두산	1997.12.	1150	4	2	135	114.8	109.3	153.7	200.0	31.5	46.3	66.7	59.3	E	127	18	11	N	37	38	57
256	GyeongGi	DongDooCheon	생연	에이스 2 차	1993.06.	286	4	2	123	73.2	70.3	78.0	81.3	43.9	44.3	39.0	37.4	E	127	3	43	N	37	53	36
257	GyeongGi	DongDooCheon	생연	에이스 3 차	1993.06.	270	4	2	104		82.7	94.2	93.8		48.1	43.8	43.3	E	127	3	43	N	37	53	53
258	GyeongGi	DongDooCheon	생연	에이스 5 차	1999.07.	326	4	2	102		107.8	98.0	93.1		44.1	44.6	41.7	E	127	3	37	N	37	53	50
259	GyeongGi	BooCheon	괴안	삼익	1989.08.	682	4	2	109	146.8	130.7	215.6	279.8	71.1	80.3	105.5	114.7	E	126	48	11	N	37	28	38
260	GyeongGi	BooCheon	괴안	삼익세라믹	1988.12.	781	4	2	109	151.4	135.3	201.8	289.0	71.1	73.4	103.2	114.7	E	126	48	7	N	37	28	32
261	GyeongGi	BooCheon	상	사랑벽산	1994.05.	324	4	2	135	194.4	170.4	285.2	488.9	81.5	92.6	127.8	155.6	E	126	45	33	N	37	29	45
262	GyeongGi	BooCheon	상	꿈동산신안	1994.06.	668	4	2	135	200.0	174.1	300.0	514.8	70.4	96.3	129.6	159.3	E	126	45	26	N	37	29	35
263	GyeongGi	BooCheon	소사	두산	1995.03.	524	4	2	135	151.9	133.3	214.8	322.2	61.1	68.5	96.3	96.3	E	126	48	0	N	37	28	4
264	GyeongGi	BooCheon	소사	청구	1995.03.	202	4	2	136	143.4	128.7	213.2	301.5	60.7	68.0	95.6	95.6	E	126	47	58	N	37	28	8
265	GyeongGi	BooCheon	송내	뉴서울	1995.10.	971	4	2	124	161.3	143.1	250.0	340.7	70.6	84.7	116.9	137.1	E	126	45	45	N	37	29	9
266	GyeongGi	BooCheon	송내	대한	1994.10.	161	4	2	111	157.7	148.6	202.7	346.8	67.6	81.1	108.1	144.1	E	126	46	1	N	37	28	41
267	GyeongGi	BooCheon	송내	우성고층	1990.04.	798	4	2	128	144.5	144.5	234.4	324.2	74.2	74.2	109.4	132.8	E	126	45	36	N	37	29	5
268	GyeongGi	BooCheon	원미	풍림	1999.01.	808	4	2	114		157.9	201.8	320.2		83.3	109.6	127.2	E	126	47	29	N	37	29	29
269	GyeongGi	BooCheon	원미	두산	1998.10.	820	4	2	119	130.3	155.5	193.3	294.1	50.4	84.0	113.4	105.0	E	126	47	39	N	37	29	43
270	GyeongGi	BooCheon	역곡	한국	1996.08.	497	4	2	134	156.7	156.7	192.2	242.5	67.2	78.4	100.7	111.9	E	126	48	49	N	37	29	35
271	GyeongGi	BooCheon	원미	풍림	1999.01.	808	4	2	114		157.9	201.8	320.2		83.3	109.6	127.2	E	126	47	29	N	37	29	29
272	GyeongGi	BooCheon	원종	신동문	1998.07.	216	4	2	109		142.2	211.0	266.1		80.3	100.9	110.1	E	126	47	53	N	37	31	45
273	GyeongGi	BooCheon	중	은하동부	1993.12.	316	4	2	135	174.1	155.6	288.9	481.5	64.8	81.5	100.0	140.7	E	126	45	55	N	37	30	21
274	GyeongGi	BooCheon	중	중흥두산	1993.04.	258	4	2	134	167.9	143.7	250.0	485.1	61.6	82.1	97.0	141.8	E	126	46	27	N	37	30	16
275	GyeongGi	BooCheon	중	보람아주	1995.05.	1398	4	2	126	194.4	170.6	297.6	460.3	73.4	91.3	127.0	146.8	E	126	45	30	N	37	29	55
276	GyeongGi	BooCheon	중	연화쌍용	1994.02.	349	4	2	134	182.8	145.5	253.7	485.1	69.0	78.4	108.2	115.7	E	126	46	51	N	37	29	51
277	GyeongGi	BooCheon	중	꿈삼환	1994.07.	348	4	2	134	175.4	143.7	246.3	485.1	65.3	78.4	100.7	115.7	E	126	46	46	N	37	30	3
278	GyeongGi	SeongNam	구미	까치대우	1995.12.	976	4	2	135	300.0	288.9	425.9	777.8	88.9	122.2	159.3	207.4	E	127	7	2	N	37	21	0
279	GyeongGi	SeongNam	금곡	청솔동아	1995.02.	204	4	2	135	244.4	251.9	425.9	603.7	85.2	114.8	144.4	181.5	E	127	6	56	N	37	21	19
280	GyeongGi	SeongNam	이매동	아름두산	1992.08.	566	4	2	132	261.4	219.7	454.5	765.2	87.1	106.1	151.5	200.8	E	127	7	11	N	37	24	0
281	GyeongGi	SeongNam	분당	샛별동성	1992.06.	582	4	2	134	264.9	276.1	488.8	794.8	85.8	138.1	194.0	253.7	E	127	7	55	N	37	22	20
282	GyeongGi	SeongNam	서현	효자동아	1992.07.	648	4	2	128	246.1	234.4	449.2	781.3	84.0	121.1	171.9	257.8	E	127	8	7	N	37	22	39
283	GyeongGi	SeongNam	서현	효자삼환	1993.03.	632	4	2	130	246.2	246.2	434.6	780.8	80.8	134.6	161.5	226.9	E	127	8	2	N	37	22	24
284	GyeongGi	SeongNam	단대	진로	1998.12.	499	4	2	115	171.7	184.8	260.9	367.4	73.9	104.3	134.8	143.5	E	127	9	22	N	37	27	4
285	GyeongGi	SeongNam	수내	푸른신성	1992.06.	642	4	2	130	253.8	246.2	434.6	826.9	80.8	123.1	169.2	219.2	E	127	7	37	N	37	22	6
286	GyeongGi	SeongNam	수진	현대	1994.10.	107	4	2	124		177.4	197.6	310.5		127.0	116.9	141.1	E	127	7	54	N	37	26	23
287	GyeongGi	SeongNam	수진	삼부	1996.11.	834	4	2	135	229.6	181.5	277.8	418.5	92.6	100.0	140.7	166.7	E	127	7	26	N	37	26	19
288	GyeongGi	SeongNam	수내	양지금호	1993.02.	1490	4	2	134	313.4	276.1	477.6	895.5	97.0	130.6	186.6	246.3	E	127	7	2	N	37	22	25
289	GyeongGi	SeongNam	야탑	장미동부	1993.02.	1134	4	2	132	253.8	231.1	473.5	765.2	87.1	108.0	159.1	212.1	E	127	7	39	N	37	24	55
290	GyeongGi	SeongNam	정자	정든동아	1995.04.	1006	4	2	124	290.3	274.2	423.4	778.2	88.7	133.1	177.4	221.8	E	127	7	16	N	37	21	37
291	GyeongGi	SeongNam	하대원	현대	1995.04.	314	4	2	121	210.7	173.6	256.2	376.0	82.6	86.8	111.6	132.2	E	127	9	5	N	37	25	57
292	GyeongGi	SeongNam	야탑	탑선경	1992.08.	976	4	2	131	251.9	217.6	438.9	744.3	80.2	103.1	141.2	183.2	E	127	7	15	N	37	24	27
293	SooWon	GwonSeon	곡반정	삼성	2000.10.	442	4	2	119		127.7	205.9	289.9		69.3	113.4	111.3	E	127	1	44	N	37	14	5
294	SooWon	GwonSeon	구운	성원	1999.10.	458	4	2	135		128.9	201.9	263.0		64.8	100.0	120.4	E	126	58	34	N	37	16	59
295	SooWon	GwonSeon	권선	동아	1994.04.	360	4	2	135	151.9	114.8	200.0	255.6	75.9	70.4	103.7	140.7	E	127	1	29	N	37	14	58
296	SooWon	GwonSeon	권선	신안	1996.07.	276	4	2	134	156.7	138.1	235.1	343.3	78.4	78.4	115.7	167.9	E	127	2	4	N	37	15	14
297	SooWon	GwonSeon	금곡	삼익 1 차	1995.05.	400	4	2	125		100.0	134.0	214.0		60.4	74.0	104.0	E	126	57	16	N	37	16	16
298	SooWon	YoungTong	매탄	임광	1990.12.	1320	4	2	125	142.0	122.0	208.0	412.0	78.0	78.0	100.0	144.0	E	127	2	27	N	37	15	18
299	SooWon	YoungTong	매탄	한국 1 차	1993.04.	496	4	2	130	146.2	115.4	188.5	342.3	82.7	73.1	96.2	96.2	E	127	3	23	N	37	16	8
300	SooWon	YoungTong	매탄	현대	1988.01.	690	4	2	125	158.0	122.0	214.0	378.0	76.0	78.0	108.0	148.0	E	127	2	33	N	37	16	4
301	SooWon	GwonSeon	세류	삼익	1999.01.	344	4	2	114		140.4	177.6	276.3		76.8	100.9	118.4	E	127	1	2	N	37	15	40
302	SooWon	GwonSeon	세류	성원	1996.04.	366	4	2	135	103.7	111.1	183.3	288.9	53.7	64.8	100.0	100.0	E	127	0	56	N	37	15	48
303	SooWon	YoungTong	영통	살구골동아	1998.02.	320	4	2	135	148.1	174.1	288.9	488.9	44.4	85.2	114.8	153.7	E	127	4	7	N	37	14	52
304	SooWon	JangAn	영화	동성영화타운	1997.01.	178	4	2	135	125.9	129.6	146.7	192.6	70.4	70.4	74.1	100.0	E	127	0	43	N	37	17	28
305	SooWon	PalDal	우만	선경	1995.10.	372	4	2	134	190.3	160.4	179.1	272.4	117.5	82.1	93.3	106.3	E	127	2	11	N	37	16	30
306	SooWon	JangAn	율전	신일	1997.12.	824	4	2	126	144.8	134.9	198.4	337.3	55.6	63.5	107.1	150.8	E	126	57	59	N	37	17	59
307	SooWon	PalDal	인계	선경 1 차	1993.06.	360	4	2	134	138.1	147.4	179.1	309.7	63.4	82.1	97.0	119.4	E	127	2	11	N	37	16	34
308	SooWon	JangAn	정자	벽산 3 차	2000.08.	389	4	2	136		147.1	235.3	345.6		75.4	117.6	147.1	E	126	59	46	N	37	17	41
309	SooWon	JangAn	조원	벽산	1989.07.	740	4	2	110		104.5	177.3	293.2		70.5	95.5	100.0	E	127	1	16	N	37	17	51
310	SooWon	GwonSeon	탑	삼성	1998.09.	299	4	2	132	123.1	111.7	159.1	214.0	54.9	64.4	79.5	98.5	E	126	58	30	N	37	16	27
311	SooWon	GwonSeon	호매실	LG 삼익	1997.09.	1754	4	2	128	121.1	119.1	187.5	277.3	39.1	64.5	89.8	109.4	E	126	57	33	N	37	16	4

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/m²)				Rent (JeonSe*) (10 US $/m²)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
312	GyeongGi	SiHeung	대야	우성 1 차	1996.01.	188	4	2	135	113.0	118.5	177.8	253.7	53.7	61.1	98.1	100.0	E	126	47	36	N	37	26	46
313	GyeongGi	SiHeung	대야	청구 2 차	1997.07.	462	4	2	135	129.6	148.1	214.8	283.3	40.7	72.2	100.0	111.1	E	126	47	34	N	37	26	31
314	GyeongGi	SiHeung	대야	극동	2000.07.	350	4	2	119		134.5	176.5	176.5		71.4	117.6	117.6	E	126	47	13	N	37	26	55
315	GyeongGi	SiHeung	도창	에이스	1997.01.	798	4	2	102		107.8	149.5	205.9		71.1	71.1	98.0	E	126	49	0	N	37	24	35
316	GyeongGi	SiHeung	은행	대우 3 차	1998.10.	1272	4	2	103	128.6	152.9	220.9	320.4	41.3	85.0	121.4	131.1	E	126	47	48	N	37	26	33
317	GyeongGi	SiHeung	장곡	진말우성	1999.06.	320	4	2	134		132.5	175.4	272.4		54.1	72.8	104.5	E	126	47	11	N	37	22	50
318	GyeongGi	SiHeung	장곡	숲속마을 1 단지	1999.08.	1246	4	2	135		125.9	172.2	214.8		55.6	72.2	103.7	E	126	46	50	N	37	22	42
319	GyeongGi	SiHeung	장현	새재마을대동	1999.09.	480	4	2	114		132.0	166.7	263.2		59.2	74.6	92.1	E	126	47	59	N	37	22	46
320	GyeongGi	SiHeung	정왕	동원	1998.03.	358	4	2	120	97.9	118.8	179.2	270.8	35.4	60.4	91.7	116.7	E	126	44	1	N	37	21	59
321	GyeongGi	SiHeung	정왕	화성	1997.08.	420	4	2	128	87.9	111.3	162.1	171.9	32.0	56.6	76.2	78.1	E	126	44	3	N	37	21	32
322	GyeongGi	SiHeung	정왕	대림 3 단지	1998.03.	280	4	2	115	105.7	123.9	187.0	247.8	34.8	58.7	95.7	104.3	E	126	43	52	N	37	21	55
323	GyeongGi	AnSan	본오	우성고층	1990.04.	1080	4	2	127	129.9	110.2	192.9	318.9	61.0	65.0	86.6	110.2	E	126	51	52	N	37	17	51
324	GyeongGi	AnSan	본오	태영고층	1991.07.	372	4	2	121	121.9	110.7	170.2	314.0	55.8	66.1	86.8	136.4	E	126	51	41	N	37	17	51
325	GyeongGi	AnSan	사	선경	1994.07.	550	4	2	130	138.5	115.4	178.8	257.7	61.5	65.4	96.2	112.7	E	126	51	1	N	37	17	30
326	GyeongGi	AnSan	사	현대 2 차	1995.02.	520	4	2	135	131.5	113.0	190.7	292.6	53.7	66.7	92.6	140.7	E	126	51	17	N	37	17	29
327	GyeongGi	AnSan	선부	공작한양고층	1992.05.	1470	4	2	131	118.3	95.4	148.9	248.1	55.3	51.5	80.2	97.3	E	126	48	44	N	37	20	23
328	GyeongGi	AnSan	성포	선경	1990.12.	1768	4	2	129	145.3	119.0	178.3	234.5	69.8	79.5	91.1	110.5	E	126	50	34	N	37	19	32
329	GyeongGi	AnSan	월피	현대 2 차	1990.11.	360	4	2	122	123.0	104.5	143.4	221.3	54.1	73.8	86.1	123.0	E	126	50	59	N	37	19	51
330	GyeongGi	AnSeong	금산	주은청설	1999.10.	457	4	2	121		109.1	132.2	165.3		53.7	78.5	90.9	E	127	16	2	N	37	0	52
331	GyeongGi	AnSeong	봉산	한주	1994.01.	395	4	2	123	95.5	81.3	79.3	101.6	36.6	38.2	42.7	65.0	E	127	16	41	N	37	0	36
332	GyeongGi	AnSeong	당왕	태영	2000.04.	234	4	2	115		108.7	139.1	165.2		63.0	82.6	95.7	E	127	15	31	N	37	0	55
333	GyeongGi	AnSeong	숭인	동신	1995.10.	496	4	2	131		91.6	110.7	133.6		42.0	57.3	80.2	E	127	16	31	N	37	0	43
334	GyeongGi	AnSeong	공도	삼성	2002.08.	348	4	2	129			137.6	162.8			73.6	85.3	E	127	8	29	N	36	59	40
335	GyeongGi	AnYang	호계	샘대우	1994.01.	536	4	2	135	214.8	211.1	292.6	611.1	77.8	100.0	114.8	174.1	E	126	57	51	N	37	22	33
336	GyeongGi	AnYang	관양	현대	1985.04.	904	4	2	123	211.4	178.9	280.5	548.8	85.4	93.5	126.0	170.7	E	126	57	26	N	37	24	24
337	GyeongGi	AnYang	평촌	꿈라이프	1993.02.	548	4	2	110	213.6	200.9	318.2	722.7	88.6	113.6	168.2	259.1	E	126	58	4	N	37	23	11
338	GyeongGi	AnYang	박달	금호	1996.10.	752	4	2	127	167.3	143.7	198.8	326.8	80.7	72.8	102.4	102.4	E	126	54	5	N	37	23	56
339	GyeongGi	AnYang	석수	럭키	1987.06.	735	4	2	114	163.6	136.0	223.7	416.7	75.9	76.8	109.6	136.0	E	126	54	28	N	37	24	34
340	GyeongGi	AnYang	안양	성원 1 차	1995.11.	934	4	2	139	187.1	156.5	199.6	295.0	82.7	82.7	111.5	111.5	E	126	54	52	N	37	23	40
341	GyeongGi	AnYang	비산	뉴타운삼호 5 차	1985.11.	540	4	2	129	189.9	176.4	246.1	569.8	89.1	87.2	100.8	162.8	E	126	56	39	N	37	24	8
342	GyeongGi	AnYang	평촌	꿈금호	1994.05.	254	4	2	134	227.6	223.9	317.2	768.7	85.8	111.9	160.4	250.0	E	126	57	56	N	37	23	7
343	GyeongGi	YangJoo	광사	신도	1999.09.	400	4	2	125		112.0	124.0	132.0		38.4	42.0	42.0	E	127	4	27	N	37	47	34
344	GyeongGi	YangJoo	덕정	청담주공	2001.06.	960	4	2	108		112.5	150.5	175.9		62.5	62.5	69.4	E	127	4	0	N	37	49	59
345	GyeongGi	YangJoo	백석	동화은하수장미	1999.07.	443	4	2	123		105.7	109.8	132.1		40.7	50.8	50.8	E	126	59	2	N	37	46	57
346	GyeongGi	YangJoo	고읍	현대	1999.12.	293	4	2	134		108.2	125.0	145.5		37.3	42.9	46.6	E	127	4	45	N	37	48	7
347	GyeongGi	YangPyung	양서	훼미리	1992	115	4	2	120		79.2	97.9	112.5		35.4	50.0	59.2	E	127	19	6	N	37	32	45
348	GyeongGi	OSan	갈곶	동부 2 차	2000.07.	753	4	2	102		112.7	178.9	171.6		66.2	93.1	90.7	E	127	4	10	N	37	7	49
349	GyeongGi	OSan	수청	대우	1994.01.	1144	4	2	101		104.0	173.3	173.3		49.5	86.6	84.2	E	127	3	45	N	37	9	54
350	GyeongGi	OSan	누읍	한라그린	2000.06.	784	4	2	116		106.5	150.9	163.8		40.1	71.1	73.3	E	127	2	58	N	37	8	32
351	GyeongGi	OSan	오산	현대	2000.04.	530	4	2	135		125.9	218.5	227.8		66.7	114.8	111.1	E	127	4	32	N	37	9	9
352	GyeongGi	OSan	원	두산동아	1999.07.	516	4	2	130		115.4	165.4	173.1		61.5	84.6	80.8	E	127	4	15	N	37	8	3
353	GyeongGi	YongIn	영덕	신일	1998.11.	901	4	2	127	114.2	141.7	169.3	303.1	41.3	68.9	74.8	110.2	E	127	5	40	N	37	16	5
354	GyeongGi	YongIn	신갈	신갈삼익	1996.12.	296	4	2	101	170.8	131.2	178.2	321.8	71.8	76.7	81.7	94.1	E	127	6	22	N	37	16	41
355	GyeongGi	YongIn	동천	풍림	1998.08.	271	4	2	114		188.6	254.4	438.6	0.0	109.6	96.5	144.7	E	127	6	1	N	37	20	30
356	GyeongGi	YongIn	마북	구성우림	1998.01.	362	4	2	133	131.6	165.4	184.2	357.1	50.8	63.9	67.7	90.2	E	127	6	48	N	37	17	47
357	GyeongGi	YongIn	마평	우성	1995.06.	358	4	2	135	118.5	114.8	129.6	137.0	55.6	70.4	77.8	77.8	E	127	12	54	N	37	14	6
358	GyeongGi	YongIn	풍덕천	삼성 1 차	1995.01.	576	4	2	135	300.0	211.1	292.6	444.4	100.0	85.2	85.2	118.5	E	127	5	19	N	37	19	35
359	GyeongGi	YongIn	죽전	죽전벽산 1 단지	1997.08.	612	4	2	115	271.7	234.8	343.5	521.7	95.7	108.7	143.5	173.9	E	127	6	20	N	37	20	9
360	GyeongGi	YongIn	언남	동부	1998.12.	446	4	2	135	148.1	155.6	170.4	311.1	51.9	63.0	79.6	77.8	E	127	7	23	N	37	17	36
361	GyeongGi	EuiWang	삼	효성청솔	1997.09.	469	4	2	117	141.0	145.3	217.9	299.1	64.1	66.2	106.8	153.8	E	126	57	20	N	37	19	7
362	GyeongGi	EuiWang	오전	진달래	1998.05.	565	4	2	114	140.4	175.4	258.8	399.1	46.1	89.9	120.6	153.5	E	126	57	58	N	37	22	0
363	GyeongGi	EuiWang	오전	이삭민들레	2000.06.	369	4	2	115		171.7	200.0	326.1		89.1	108.7	130.4	E	126	58	46	N	37	20	57
364	GyeongGi	EuiWang	포일	인덕원삼호	1991.04.	684	4	2	127		194.9	303.1	582.7		102.4	129.9	295.3	E	126	58	51	N	37	23	49
365	GyeongGi	EuiJeongBoo	금오	세아	1993.01.	249	4	2	122		94.3	110.7	131.1		47.1	59.4	77.9	E	127	4	24	N	37	45	29
366	GyeongGi	EuiJeongBoo	신곡	성원 1 차	1993.07.	525	4	2	115	121.7	100.0	121.7	134.8	54.3	65.2	71.7	73.9	E	127	4	20	N	37	44	12
367	GyeongGi	EuiJeongBoo	용현	건영	1998.07.	930	4	2	113	108.0	103.1	126.1	146.0	33.2	55.3	66.4	70.8	E	127	4	46	N	37	44	11
368	GyeongGi	EuiJeongBoo	호원	미도	1995.11.	552	4	2	134	164.2	136.2	153.0	179.1	56.0	61.6	85.8	82.1	E	127	2	32	N	37	43	29
369	GyeongGi	EuiJeongBoo	장암	우성	1992.12.	510	4	2	127	147.6	108.3	133.9	185.0	61.0	57.1	74.8	81.1	E	127	3	41	N	37	43	28
370	GyeongGi	EuiJeongBoo	호원	신도 6 차	1997.11.	741	4	2	127	165.4	153.5	173.2	171.3	63.0	65.0	98.4	90.6	E	127	2	19	N	37	43	36
371	GyeongGi	ECheon	백사	현대	1998.01.	495	4	2	115		73.9	87.0	160.9		41.3	60.9	73.9	E	127	28	7	N	37	18	15

No.	Address			Apt. Complex	Built year	House-holds	Bed-room	Bath-room	Floor area	Price (10 US $/$m^2$)				Rent (JeonSe*) (10 US $/$m^2$)				Longitude				Latitude			
										1998	2001	2004	2007	1998	2001	2004	2007		°	`	``		°	`	``
372	GyeongGi	ECheon	부발	청구	1999.12.	304	4	2	127		92.5	128.0	153.5		49.2	72.8	72.8	E	127	29	1	N	37	15	24
373	GyeongGi	ECheon	장호원	현대	1997.01.	362	4	2	132	75.8	75.8	73.9	121.2	45.5	41.7	43.6	56.8	E	127	37	6	N	37	6	52
374	GyeongGi	ECheon	증포	선경	1997.01.	238	4	2	118	112.3	112.3	139.8	178.0	42.4	59.3	84.7	97.5	E	127	27	12	N	37	17	34
375	GyeongGi	PaJoo	검산	성원	2000.04.	656	4	2	136		115.8	126.8	191.2		46.0	57.0	58.8	E	126	44	56	N	37	46	23
376	GyeongGi	PaJoo	금능	흰돌마을장안 6 차	1999.10.	498	4	2	132		138.3	159.1	261.4		58.7	66.3	72.0	E	126	47	1	N	37	45	19
377	GyeongGi	PaJoo	금촌	동문 1 차	1993.01.	244	4	2	119	96.6	96.6	107.1	115.5	39.9	50.4	52.9	51.7	E	126	46	29	N	37	46	13
378	GyeongGi	PaJoo	조리	한라	2000.06.	1202	4	2	117		132.5	153.8	265.0		57.7	66.2	66.2	E	126	48	2	N	37	44	30
379	GyeongGi	PyungTaek	독곡	라이프	1992.10.	483	4	2	131	84.0	80.2	179.4	133.6	43.9	53.4	99.2	74.4	E	127	3	39	N	37	4	59
380	GyeongGi	PyungTaek	동삭	삼익	2000.11.	672	4	2	119		96.6	153.4	159.7		46.2	67.2	86.1	E	127	5	48	N	37	1	19
381	GyeongGi	PyungTaek	비전	한빛경남선경	1997.01.	448	4	2	135	129.6	138.9	225.9	235.2	64.8	68.5	129.6	140.7	E	127	6	56	N	36	59	46
382	GyeongGi	PyungTaek	비전	동아목련	1993.10.	418	4	2	135	124.1	118.5	159.3	159.3	59.3	59.3	81.5	88.9	E	127	6	7	N	36	59	32
383	GyeongGi	PyungTaek	이충	건영	1998.01.	560	4	2	135	103.7	109.3	222.2	185.2	48.1	57.4	114.8	107.4	E	127	4	7	N	37	3	49
384	GyeongGi	PyungTaek	합정	참이슬	1999.08.	862	4	2	125		126.0	204.0	212.0	0.0	70.0	116.0	140.0	E	127	7	7	N	36	59	24
385	GyeongGi	PyungTaek	통복	삼성	1993.05.	624	4	2	102	85.8	88.2	144.6	152.0	52.9	53.9	80.9	84.3	E	127	4	46	N	36	59	30
386	GyeongGi	PoCheon	소흘	원일 1 차	1993.05.	318	4	2	130			88.5	100.0			54.6	48.1	E	127	8	32	N	37	49	35
387	GyeongGi	PoCheon	소흘	일신건영	1993.04.	176	4	2	113		79.6	92.9	97.3		48.7	50.9	50.9	E	127	8	30	N	37	49	32
388	GyeongGi	HaNam	덕풍	쌍용	1997.11.	585	4	2	115	160.9	160.9	256.5	295.7	82.6	82.6	126.1	130.4	E	127	11	58	N	37	31	59
389	GyeongGi	HaNam	덕풍	서해	1996.04.	423	4	2	103	199.0	179.6	252.4	373.8	85.0	94.7	131.1	145.6	E	127	11	50	N	37	32	35
390	GyeongGi	HaNam	신장	동일	1999.09.	438	4	2	134		186.6	257.5	388.1		82.1	123.1	149.3	E	127	13	11	N	37	32	28
391	GyeongGi	HaNam	창우	은행	1994.05.	1360	4	2	135	203.7	177.8	300.0	396.3	72.2	85.2	129.6	140.7	E	127	13	21	N	37	32	19

* see footnote 94

Appendix 6-3 Location of centre of spatial submarkets in Seoul

Table 40 Location of centre of spatial submarkets in Seoul

Spatial submarket	Centre	Longitude	Latitude	X*	Y*
GS	YeokSam station	127°02'12"	37°30'03"	3.24 km E	55.59 km N
JJ	EulJiRo 1Ga station	126°58'57"	37°33'57"	1.55 km W	62.81 km N
YG	YeoUiDo station	126°55'27"	37°31'18"	6.70 km W	57.91 km N

* the longitude base of X is 127° and the latitude base of Y is 37°

Appendix 6-4 ID codes of local authorities in Seoul Metropolitan Area

Table 41 ID codes of local authorities in Seoul Metropolitan Area

Local authority	id	Local authority	id	Local authority	id
JongRo	1	GangNam	23	GoYang	45
Joong	2	SongPa	24	GwaCheon	46
YongSan	3	GangDong	25	GooRi	47
SeongDong	4	Joong(InCheon)	26	NamYangJoo	48
GwangJin	5	Dong	27	OSan	49
DongDaeMoon	6	Nam	28	SiHeung	50
JoongRang	7	YonSoo	29	GoonPo	51
SeongBook	8	NamDong	30	EuiWang	52
GangBook	9	BooPyoung	31	HaNam	53
DoBong	10	GyeYang	32	YongIn	54
NoWon	11	Seo	33	PaJoo	55
EunPyoung	12	GangHwa	34	ECheon	56
SeoDaeMoon	13	OngJin	35	AnSeong	57
MaPo	14	SooWon	36	GimPo	58
YangCheon	15	SeongNam	37	HwaSeong	59
GangSeo	16	EuiJungBoo	38	GwangJoo	60
GooRo	17	AnYang	39	YangJoo	61
GeumCheon	18	BooCheon	40	PoCheon	62
YongDeungPo	19	GwangMyoung	41	YeoJoo	63
DongJak	20	PyoungTaek	42	YeonCheon	64
GwanAk	21	DongDooCheon	43	GaPyoung	65
SeoCho	22	AnSan	44	YangPyoung	66

Appendix 6-5 Commuting data in Seoul

Table 42 Commuting flow matrix in Seoul

	GangNam	GangDong	GangBook	GangSeo	GwanAk	GwangJin	GooRo	GeumCheon	NoWon	DoBong	DongDaeMoon	DongJak	MaPo	SeoDaeMoon	SeoCho	SeongDong	SeongBook	SongPa	YoungDeungPo	YongSan	EunPyoung	JongRo	Joong	JoongRang	Total
GangNam	148028	19904	9664	11570	30124	21745	11008	5616	19765	10253	11593	20105	10672	8981	29102	17375	12446	40914	11767	8066	11536	4013	5455	15516	495218
GangDong	1884	101517	800	661	970	3615	413	180	2126	807	1690	657	473	582	1125	1884	1139	10426	562	417	734	259	376	2458	135755
GangBook	424	369	59458	431	351	400	265	53	5922	11265	1329	463	292	503	258	496	6687	512	257	387	575	537	271	1061	92566
GangSeo	994	577	630	113704	2489	515	3930	1124	1011	495	540	2052	2862	1917	1035	637	940	859	4413	759	1784	275	442	596	144580
GwanAk	3894	1143	713	2713	108014	1208	3964	5794	1117	781	739	9380	1673	1222	4702	953	1083	1896	3995	1063	1054	431	530	933	158995
GwangJin	4265	7024	1484	1329	2214	78726	1022	388	5782	2622	4827	1817	1641	1148	2226	6542	2238	7019	1072	883	1234	686	561	8937	145687
GooRo	1847	1139	1086	6705	8135	1305	79521	6976	1870	1324	1208	4447	2935	1985	1825	1263	1368	1511	7882	1215	2207	512	567	1358	140191
GeumCheon	929	393	283	2071	6281	460	7126	60332	639	368	359	2801	1109	748	1096	479	567	676	3657	450	833	230	154	407	92448
NoWon	1690	1848	8007	1009	749	2432	815	203	130315	15844	4388	1064	1181	914	1155	1354	8619	1882	728	580	1279	609	421	10338	197424
DoBong	454	394	6823	317	248	473	247	128	8385	65896	1172	387	302	327	289	657	2866	613	315	161	650	286	157	1691	93238
DongDaeMoon	4663	4452	6381	2558	2733	6914	2020	954	11661	6852	96509	2878	2705	2647	2992	6659	10268	4726	2433	1713	3245	1920	1063	15815	204761
DongJak	3254	1454	1050	4199	13514	1459	4398	3473	2468	1328	1495	73954	1983	1401	4393	1014	1970	2563	7740	2004	1744	775	608	1536	139777
MaPo	3647	2139	2254	8646	4902	2197	4449	1869	3334	2366	2405	4145	75354	10961	2803	2148	3335	2851	6587	4043	10037	1565	1753	1972	165762
SeoDaeMoon	6033	2829	2436	5686	3453	2214	3102	1072	3538	2703	2335	3094	12513	71250	4503	2403	3495	3990	4120	2337	13772	2589	1396	1984	162847
SeoCho	21096	5982	3712	5477	19473	6000	6254	3093	7407	3337	3923	17424	4971	4517	80247	5659	5472	11064	6378	4072	5435	1902	1963	5209	240067
SeongDong	4757	4749	2764	2022	2411	10710	1183	586	5246	2971	6317	2103	2224	1897	2582	71025	3926	5423	1430	1481	2174	1028	1718	5926	146653
SeongBook	4512	3020	14007	2635	2330	2647	1896	596	12173	8597	7122	2414	2874	2825	3142	2452	91028	3575	1880	1487	3614	2594	1084	4445	182949
SongPa	7674	25443	1726	2175	4486	8746	1305	716	4301	2140	2865	2957	1710	1400	3429	3953	2498	147179	1885	1201	1916	569	767	4337	235378
YoungDeungPo	6051	2843	2520	20629	13226	3208	16159	6634	4710	3217	3079	12188	11460	5664	5993	3635	4554	3984	83745	3996	5715	1701	1427	2455	228793
YongSan	4704	2630	3028	3713	5654	2110	4146	2156	5037	2882	2832	7138	6373	3487	3986	4190	4294	3599	5929	44484	4618	1510	2155	2369	133024
EunPyoung	542	308	730	1469	648	372	791	277	798	545	653	588	3043	8492	510	314	966	514	996	472	90878	809	264	555	115534
JongRo	7836	6194	11248	7287	6038	6423	4996	2204	14124	10196	9951	6505	9051	14456	7062	6861	18677	6443	5767	4903	15433	40673	3291	7235	232854
Joong	11393	7415	12213	14107	9678	10222	7198	2981	16899	11714	11558	10093	16140	12937	9585	17109	17629	9912	10320	11324	14510	7461	63803	9832	326033
JoongRang	686	1187	1542	239	429	2666	255	212	7597	2004	4866	489	478	464	349	1219	2085	1031	321	310	607	466	255	87352	117109
Total	251257	204953	154559	221352	248550	176767	166463	107617	276225	170507	183755	189143	174019	160725	174389	160281	208150	273162	174179	97808	195584	73400	90481	194317	4327643

Appendix 6-6 Pajek data of commuting in Seoul (over 10000 trip)

*Vertices 51
1 3 0.1981455 0.4476797 0.5
2 2 0.1995408 0.4508622 0.5
3 4 0.2035431 0.4498832 0.5
4 23 0.2054818 0.443829 0.5
5 5 0.2076375 0.4492964 0.5
6 6 0.204785 0.4532635 0.5
7 7 0.2081423 0.4550527 0.5
8 11 0.2065427 0.4611381 0.5
9 8 0.2014582 0.455927 0.5
10 1 0.1979478 0.4546354 0.5
11 9 0.2008976 0.4601032 0.5
12 10 0.2027745 0.4629748 0.5
13 12 0.1936391 0.457529 0.5
14 13 0.1945412 0.4528346 0.5
15 14 0.1919418 0.4507793 0.5
16 45 0.1819961 0.4628996 0.5
17 19 0.1919386 0.4467032 0.5
18 15 0.187174 0.4469617 0.5
19 16 0.1843704 0.4510196 0.5
20 17 0.1871805 0.4435629 0.5
21 20 0.1956391 0.4441049 0.5
22 22 0.2026384 0.4412746 0.5
23 21 0.1951202 0.440559 0.5
24 24 0.2101797 0.4447211 0.5
25 25 0.2130003 0.4497728 0.5
26 37 0.2144427 0.4367846 0.5
27 28 0.1702991 0.4390329 0.5
28 26 0.1665244 0.4428175 0.5
29 30 0.175776 0.4365457 0.5
30 29 0.1706645 0.435212 0.5
31 31 0.1752823 0.4438743 0.5
32 32 0.1764745 0.4505968 0.5
33 33 0.1692387 0.4509597 0.5
34 40 0.1803861 0.4442176 0.5
35 36 0.2044498 0.4191771 0.5
36 39 0.1959839 0.4331572 0.5
37 54 0.2196487 0.4132859 0.5
38 59 0.1888248 0.4072004 0.5
39 60 0.2265954 0.4334654 0.5
40 38 0.2059084 0.4704261 0.5
41 61 0.2000217 0.4784479 0.5
42 51 0.1929458 0.4268247 0.5
43 50 0.181356 0.4319172 0.5
44 41 0.1879821 0.43812 0.5
45 18 0.1911224 0.4398419 0.5
46 44 0.1786027 0.4213096 0.5
47 55 0.1835207 0.4838568 0.5
48 48 0.2214013 0.4623046 0.5
49 47 0.2115244 0.4551754 0.5
50 49 0.2043845 0.4070119 0.5
51 52 0.1990226 0.4289177 0.5

*Arcs
1 2 110.64
3 2 169.88
3 4 173.75
5 2 101.37
5 3 107.1
5 4 217.45
6 2 114.44
6 4 115.93
7 6 158.15
7 8 103.38
7 4 155.16
9 10
186.77
9 2 174.41
9 6 102.68
9 4 124.46
11 10
112.48
11 2
120.08
11 9
140.07
12 10
101.96
12 2
115.52
12 11
112.65
12 8
158.44
12 4
102.53
8 10
141.24
8 2 167.18
8 6 116.61
8 9 121.73
8 4 197.65
13 10
154.33
13 2
141.39
13 14
137.72
13 15
100.37
13 4
115.36
13 16
122.52
14 10
144.56
14 2
126.74
14 15
109.61
15 2 155.07
15 14
125.13
15 17 114.6
15 4 106.72
18 19
190.75
18 17
200.79
18 4 105.1
19 18
212.24
19 17
206.29
19 4 115.7
20 17
161.59
20 4 110.08
17 4 117.67
21 17
121.88
21 22
174.24
21 4 201.05
23 17
132.26
23 21
135.14
23 22
194.73
23 4 301.24
22 4 291.02
4 2 111.14
4 22 210.96
24 22
110.64
24 4 409.14
24 25
104.26
24 26
126.68
25 4 199.04
25 24
254.43
27 28
168.67
27 29
268.44
30 27
146.37
30 29
263.67
29 27
184.85
31 27 136.07
31 29 189.65
31 32 126.26
31 33 159.58
31 34 175.83
32 31 164.79
32 33 106.12
33 31 112.94
35 36 101.74
35 37 357.89
35 38 520.15
26 22 208.74
26 4 434.46
26 24 197.73
26 37 171.45
26 39 143.73
40 41 117.14
36 22 114.1
36 4 134.67
36 42 152.24
34 20 124.71
34 17 128.64
34 43 108.98
44 20 114.24
44 45 104.44
46 43 323.15
16 10 151.14
16 2 180.51
16 13 113.68
16 14 118.03
16 15 119.06
16 17 129.27
16 4 129.46
16 47 164.85
48 49 152.74
50 38 120.29
43 46 234.95
42 36 193.66
51 36 145.12
37 22 120.04
37 4 220.76
37 35 199.27
37 26 306.38
47 16 154.5
38 35 211.56
39 26 145.4

Appendix 6-7 Regression result in Seoul

Table 43 OLS Regression of 2 bedroom apt price on distance to centre in Seoul (GS)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	116		154		154		154	
F	257.91		368.9		265.37		206.84	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.694		0.708		0.636		0.576	
Adj R-squared	0.691		0.706		0.633		0.574	
Root MSE	34.6		39.9		92.5		140.3	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-6.0	287.6	-7.1	296.9	-13.9	526.7	-18.6	694.8
Std. Err.	0.4	6.3	0.4	6.2	0.9	14.5	1.3	22.0
t	-16.1	45.4	-19.2	47.5	-16.3	36.4	-14.4	31.6
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-6.8	275.0	-7.8	284.5	-15.6	498.1	-21.2	651.4
Interval]	-5.3	300.1	-6.3	309.2	-12.2	555.3	-16.1	738.2

Table 44 OLS Regression of 2 bedroom apt price on distance to centre in Seoul (JJ)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	90		121		122		121	
F	84.47		176.24		162.25		96.36	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.490		0.597		0.575		0.447	
Adj R-squared	0.484		0.594		0.571		0.443	
Root MSE	32.7		34.9		60.9		100.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-5.6	249.7	-5.4	241.6	-9.0	365.0	-11.4	443.4
Std. Err.	0.6	7.0	0.4	5.7	0.7	9.8	1.2	16.3
t	-9.2	35.7	-13.3	42.4	-12.7	37.1	-9.8	27.3
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-6.8	235.8	-6.2	230.4	-10.4	345.6	-13.7	411.2
Interval]	-4.4	263.6	-4.6	252.9	-7.6	384.5	-9.1	475.7

Table 45 OLS Regression of 2 bedroom apt price on distance to centre in Seoul (YG)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	103		130		130		130	
F	156.56		236.49		198.67		102.48	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.608		0.649		0.608		0.445	
Adj R-squared	0.604		0.646		0.605		0.440	
Root MSE	28.9		28.4		50.9		95.2	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-4.9	231.6	-5.2	229.7	-8.5	355.2	-11.4	454.2
Std. Err.	0.4	5.7	0.3	5.0	0.6	9.0	1.1	16.8
t	-12.5	41.0	-15.4	45.9	-14.1	39.6	-10.1	27.1
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-5.7	220.4	-5.8	219.8	-9.7	337.4	-13.7	421.0
Interval]	-4.1	242.8	-4.5	239.6	-7.3	373.0	-9.2	487.5

Table 46 OLS Regression of 3 bedroom apt price on distance to centre in Seoul (GS)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	127		154		154		154	
F	212.07		310.01		211.23		180.77	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.629		0.671		0.582		0.543	
Adj R-squared	0.626		0.669		0.579		0.540	
Root MSE	40.9		43.8		107.4		174.7	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-6.3	311.8	-7.1	302.8	-14.4	542.6	-21.6	814.5
Std. Err.	0.4	6.7	0.4	6.8	1.0	16.7	1.6	27.1
t	-14.6	46.5	-17.6	44.5	-14.5	32.5	-13.4	30.0
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-7.2	298.6	-7.9	289.4	-16.3	509.7	-24.8	760.9
Interval]	-5.5	325.1	-6.3	316.3	-12.4	575.6	-18.4	868.1

Table 47 OLS Regression of 3 bedroom apt price on distance to centre in Seoul (JJ)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	90		120		122		122	
F	55.59		152.1		148.36		84.4	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.387		0.563		0.553		0.413	
Adj R-squared	0.380		0.559		0.549		0.408	
Root MSE	35.6		39.0		67.5		124.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-5.6	264.1	-5.7	246.1	-9.4	369.7	-13.0	498.3
Std. Err.	0.8	8.0	0.5	6.4	0.8	10.8	1.4	19.9
t	-7.5	33.0	-12.3	38.7	-12.2	34.3	-9.2	25.1
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-7.1	248.2	-6.6	233.5	-10.9	348.3	-15.8	458.9
Interval]	-4.1	280.0	-4.8	258.7	-7.8	391.0	-10.2	537.7

Table 48 OLS Regression of 3 bedroom apt price on distance to centre in Seoul (YG)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	105		129		129		129	
F	142.14		201		135.12		65.51	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.580		0.613		0.516		0.340	
Adj R-squared	0.576		0.610		0.512		0.335	
Root MSE	33.1		29.9		58.2		129.4	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-5.3	252.6	-5.0	227.6	-8.1	352.1	-12.5	514.1
Std. Err.	0.4	6.4	0.4	5.3	0.7	10.3	1.5	23.0
t	-11.9	39.4	-14.2	42.8	-11.6	34.0	-8.1	22.4
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-6.2	239.9	-5.8	217.0	-9.4	331.6	-15.5	468.6
Interval]	-4.4	265.3	-4.3	238.1	-6.7	372.5	-9.4	559.6

Table 49 OLS Regression of 4 bedroom apt price on distance to centre in Seoul (GS)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	110		152		152		152	
F	205.63		327.28		226.66		133.66	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.656		0.686		0.602		0.471	
Adj R-squared	0.653		0.684		0.599		0.468	
Root MSE	52.8		54.1		101.2		184.4	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-8.5	353.8	-9.4	357.5	-14.7	542.9	-20.5	803.8
Std. Err.	0.6	9.8	0.5	8.7	1.0	16.3	1.8	29.8
t	-14.3	36.0	-18.1	41.0	-15.1	33.2	-11.6	27.0
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-9.6	334.3	-10.5	340.3	-16.6	510.6	-24.1	745.0
Interval]	-7.3	373.3	-8.4	374.8	-12.7	575.1	-17.0	862.7

Table 50 OLS Regression of 4 bedroom apt price on distance to centre in Seoul (JJ)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	81		119		121		121	
F	57.85		134.72		118.22		54.29	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.423		0.535		0.498		0.313	
Adj R-squared	0.415		0.531		0.494		0.308	
Root MSE	48.1		46.3		72.4		136.8	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-6.4	285.5	-6.5	276.0	-9.2	379.7	-11.8	508.6
Std. Err.	0.8	10.1	0.6	7.7	0.8	11.8	1.6	22.3
t	-7.6	28.2	-11.6	35.8	-10.9	32.2	-7.4	22.8
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-8.0	265.4	-7.6	260.7	-10.9	356.3	-14.9	464.5
Interval]	-4.7	305.7	-5.4	291.2	-7.5	403.0	-8.6	552.7

Table 51 OLS Regression of 4 bedroom apt price on distance to centre in Seoul (YG)

	Price 1998		Price 2001		Price 2004		Price 2007	
Number of obs	97		127		128		128	
F	149.81		264.06		152.09		74.31	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.612		0.679		0.547		0.371	
Adj R-squared	0.608		0.676		0.543		0.366	
Root MSE	36.8		31.5		51.7		112.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-6.1	259.6	-6.3	252.3	-7.8	351.4	-11.9	518.8
Std. Err.	0.5	7.5	0.4	5.6	0.6	9.2	1.4	20.0
t	-12.2	34.6	-16.3	45.0	-12.3	38.3	-8.6	26.0
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-7.1	244.8	-7.0	241.2	-9.0	333.2	-14.6	479.2
Interval]	-5.1	274.5	-5.5	263.4	-6.5	369.5	-9.1	558.3

Table 52 OLS Regression of 2 bedroom apt rent on distance to centre in Seoul (GS)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	116		154		154		154	
F	281.81		395.83		398.42		291.3	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.712		0.723		0.724		0.657	
Adj R-squared	0.710		0.721		0.722		0.655	
Root MSE	18.6		23.8		33.8		44.6	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-3.4	157.3	-4.4	194.5	-6.2	268.1	-7.0	302.2
Std. Err.	0.2	3.4	0.2	3.7	0.3	5.3	0.4	7.0
t	-16.8	46.2	-19.9	52.2	-20.0	50.6	-17.1	43.3
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-3.8	150.5	-4.8	187.1	-6.8	257.6	-7.8	288.4
Interval]	-3.0	164.0	-3.9	201.8	-5.6	278.6	-6.2	316.0

Table 53 OLS Regression of 2 bedroom apt rent on distance to centre in Seoul (JJ)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	90		121		122		121	
F	197.8		342.19		287.65		213.85	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.692		0.742		0.706		0.643	
Adj R-squared	0.689		0.740		0.703		0.640	
Root MSE	15.7		18.7		27.9		35.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-4.1	150.8	-4.0	167.2	-5.5	221.8	-6.0	240.2
Std. Err.	0.3	3.4	0.2	3.1	0.3	4.5	0.4	5.7
t	-14.1	44.9	-18.5	54.7	-17.0	49.2	-14.6	41.8
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-4.7	144.1	-4.5	161.1	-6.1	212.9	-6.8	228.8
Interval]	-3.5	157.4	-3.6	173.3	-4.8	230.7	-5.2	251.5

Table 54 OLS Regression of 2 bedroom apt rent on distance to centre in Seoul (YG)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	103		130		130		130	
F	130.96		209.79		229.72		136.74	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.565		0.621		0.642		0.517	
Adj R-squared	0.560		0.618		0.639		0.513	
Root MSE	17.4		19.5		25.8		34.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-2.7	127.2	-3.4	155.3	-4.6	207.1	-4.8	225.5
Std. Err.	0.2	3.4	0.2	3.4	0.3	4.5	0.4	6.1
t	-11.4	37.3	-14.5	45.1	-15.2	45.6	-11.7	37.1
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-3.2	120.5	-3.8	148.5	-5.2	198.1	-5.6	213.5
Interval]	-2.2	134.0	-2.9	162.1	-4.0	216.1	-4.0	237.5

Table 55 OLS Regression of 3 bedroom apt rent on distance to centre in Seoul (GS)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	128		154		154		154	
F	252.78		286.94		305.66		206.17	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.667		0.654		0.668		0.576	
Adj R-squared	0.665		0.651		0.666		0.573	
Root MSE	18.7		24.9		34.0		47.3	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-3.1	150.3	-3.9	175.4	-5.5	235.9	-6.2	281.7
Std. Err.	0.2	3.1	0.2	3.9	0.3	5.3	0.4	7.4
t	-15.9	49.1	-16.9	45.3	-17.5	44.6	-14.4	38.3
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-3.5	144.3	-4.3	167.7	-6.1	225.5	-7.1	267.2
Interval]	-2.8	156.4	-3.4	183.0	-4.9	246.4	-5.4	296.2

Table 56 OLS Regression of 3 bedroom apt rent on distance to centre in Seoul (JJ)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	90		120		122		122	
F	143.87		308.24		261.96		200.51	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.621		0.723		0.686		0.626	
Adj R-squared	0.616		0.721		0.683		0.623	
Root MSE	15.6		17.6		26.5		35.0	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-4.0	142.1	-3.6	148.8	-4.9	194.4	-5.6	223.8
Std. Err.	0.3	3.5	0.2	2.9	0.3	4.2	0.4	5.6
t	-12.0	40.5	-17.6	52.0	-16.2	46.0	-14.2	40.1
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-4.6	135.1	-4.0	143.1	-5.5	186.0	-6.4	212.8
Interval]	-3.3	149.1	-3.2	154.5	-4.3	202.8	-4.8	234.9

Table 57 OLS Regression of 3 bedroom apt rent on distance to centre in Seoul (YG)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	105		129		129		129	
F	145.37		164.4		162.83		100.05	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.585		0.564		0.562		0.441	
Adj R-squared	0.581		0.561		0.558		0.436	
Root MSE	16.1		18.1		23.7		35.0	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-2.6	122.8	-2.8	136.1	-3.6	175.9	-4.2	210.5
Std. Err.	0.2	3.1	0.2	3.2	0.3	4.2	0.4	6.2
t	-12.1	39.3	-12.8	42.3	-12.8	41.8	-10.0	33.8
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-3.0	116.6	-3.2	129.8	-4.2	167.6	-5.0	198.2
Interval]	-2.2	129.0	-2.3	142.5	-3.0	184.3	-3.3	222.8

Table 58 OLS Regression of 4 bedroom apt rent on distance to centre in Seoul (GS)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	110		152		152		152	
F	223.69		317.75		299.74		238.31	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.674		0.679		0.667		0.614	
Adj R-squared	0.671		0.677		0.664		0.611	
Root MSE	22.7		28.6		40.2		47.8	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-3.8	150.4	-4.9	184.3	-6.7	249.9	-7.1	283.7
Std. Err.	0.3	4.2	0.3	4.6	0.4	6.5	0.5	7.7
t	-15.0	35.6	-17.8	39.9	-17.3	38.5	-15.4	36.7
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-4.3	142.0	-5.5	175.1	-7.5	237.1	-8.0	268.4
Interval]	-3.3	158.7	-4.4	193.4	-5.9	262.7	-6.2	299.0

Table 59 OLS Regression of 4 bedroom apt rent on distance to centre in Seoul (JJ)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	81		119		121		121	
F	93.01		193.11		215.65		156.88	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.541		0.623		0.644		0.569	
Adj R-squared	0.535		0.620		0.641		0.565	
Root MSE	21.1		22.9		30.9		39.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-3.5	126.2	-3.8	146.0	-5.3	197.5	-5.8	219.4
Std. Err.	0.4	4.5	0.3	3.8	0.4	5.0	0.5	6.4
t	-9.6	28.4	-13.9	38.4	-14.7	39.2	-12.5	34.1
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-4.3	117.4	-4.4	138.5	-6.0	187.5	-6.7	206.7
Interval]	-2.8	135.1	-3.3	153.5	-4.6	207.5	-4.9	232.2

Table 60 OLS Regression of 4 bedroom apt rent on distance to centre in Seoul (YG)

	Rent 1998		Rent 2001		Rent 2004		Rent 2007	
Number of obs	97		127		128		128	
F	100.96		247.6		193.52		85.09	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.515		0.665		0.606		0.403	
Adj R-squared	0.510		0.662		0.603		0.398	
Root MSE	18.3		16.4		22.7		34.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-2.5	107.7	-3.2	132.1	-3.9	173.5	-3.9	192.7
Std. Err.	0.2	3.7	0.2	2.9	0.3	4.0	0.4	6.1
t	-10.1	28.9	-15.7	45.1	-13.9	43.1	-9.2	31.5
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-3.0	100.3	-3.6	126.3	-4.4	165.6	-4.7	180.6
Interval]	-2.0	115.1	-2.8	137.9	-3.3	181.5	-3.1	204.8

Appendix 6-8 Employment growth by local authorty in Seoul

Table 61 Employment growth by local authority in Seoul

	1999	2000	2001	2002	2003	Rate of growth 1999-2001	Rate of growth 2001-2003	Rate of growth 1999-2003
Seoul	3367652	3574824	3763794	3805462	3791943	11.8	0.7	12.6
JongRo	215706	220414	227902	234011	224177	5.7	-1.6	3.9
Joong	328359	344329	359843	380263	374048	9.6	3.9	13.9
YongSan	117148	115570	123951	115765	117452	5.8	-5.2	0.3
SeongDong	111150	115256	110897	107184	117487	-0.2	5.9	5.7
GwangJin	80415	96663	101076	103022	102234	25.7	1.1	27.1
DongDaeMoon	124869	121753	120228	116210	119877	-3.7	-0.3	-4.0
JoongRang	79450	83149	83861	84880	83053	5.6	-1.0	4.5
SeongBook	79544	83751	85483	87336	89302	7.5	4.5	12.3
GangBook	53555	53641	56422	59261	61255	5.4	8.6	14.4
DoBong	55246	57324	57587	57888	58964	4.2	2.4	6.7
NoWon	80168	87136	90489	94640	95955	12.9	6.0	19.7
EunPyung	65768	70505	70697	72347	71563	7.5	1.2	8.8
SeoDaeMoon	81663	79729	86841	92073	89920	6.3	3.5	10.1
MaPo	129153	127826	136667	149094	147751	5.8	8.1	14.4
YangCheon	77753	92558	96080	101358	101910	23.6	6.1	31.1
GangSeo	128972	118258	132416	133630	131746	2.7	-0.5	2.2
GooRo	99326	113619	120216	117603	130381	21.0	8.5	31.3
GeumCheon	102757	103425	104232	108273	108799	1.4	4.4	5.9
YoungDeungPo	248161	249862	284448	284461	264595	14.6	-7.0	6.6
DongJak	79812	87647	86905	85857	93670	8.9	7.8	17.4
GwanAk	92147	99762	101933	104744	102207	10.6	0.3	10.9
SeoCho	241381	275292	305580	289442	302572	26.6	-1.0	25.4
GangNam	443589	496192	523107	517603	497874	17.9	-4.8	12.2
SongPA	158797	183926	194357	206722	204811	22.4	5.4	29.0
GangDong	92763	97237	102576	101795	100340	10.6	-2.2	8.2

Appendix 7-1 House and condominium data in Los Angeles

Table 62 Distribution of units of house in Los Angels

Units	Frequency	Percent
0	1,886	0.18
1	1,041,366	99.76
2	497	0.05
3	64	0.01
Total	1,043,887	100

Table 63 Distribution of bedrooms/bathrooms of house in Los Angeles (frequency)

		Number of bathrooms							
		0	1	2	3	4	5	6	Total
Number of bedrooms	0	1,076	246	17	4	1	1	0	1,345
	1	21	15,975	1,300	110	14	1	0	17,421
	2	13	198,009	59,035	4,770	325	22	2	262,176
	3	10	138,758	309,564	51,381	4,187	429	57	504,386
	4	3	8,278	111,876	74,237	12,696	2,819	362	210,271
	5	3	981	8,737	17,743	7,455	3,862	1,091	39,872
	6	0	147	821	2,234	1,661	871	389	6,123
	7	0	18	137	283	315	178	106	1,037
	8	0	4	16	54	72	51	20	217
	9	0	0	8	14	13	17	16	68
	10	0	0	1	4	4	5	4	18
	Total	1,126	362,416	491,512	150,834	26,743	8,256	2,047	1042934
								Total	1043887*

* the total number of houses is the single family detached house which has less than 11 bedrooms and less than 7 bathrooms

Table 64 Distribution of bedrooms/bathrooms of house in Los Angeles (percentage)

		Number of bathrooms							
		0	1	2	3	4	5	6	Total
Number of bedrooms	0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0
	1	0.0	1.5	0.1	0.0	0.0	0.0	0.0	2
	2	0.0	19.0	5.7	0.5	0.0	0.0	0.0	25
	3	0.0	13.3	29.7	4.9	0.4	0.0	0.0	48
	4	0.0	0.8	10.7	7.1	1.2	0.3	0.0	20
	5	0.0	0.1	0.8	1.7	0.7	0.4	0.1	4
	6	0.0	0.0	0.1	0.2	0.2	0.1	0.0	1
	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Total	0	35	47	14	3	1	0	100

Table 65 Distribution of units of condominium in Los Angeles

Units	Frequency	Percent
0	1,045	0.53
1	197,090	99.43
2	42	0.02
Total	198,214	100

Table 66 Distribution of bedrooms/bathrooms of condominium in Los Angeles (frequency)

		Number of bathrooms							
		0	1	2	3	4	5	6	Total
Number of bedrooms	0	236	1,035	244	12	1	0	0	1,528
	1	1	14,209	4,353	348	7	0	0	18,918
	2	3	6,275	61,300	36,025	376	13	0	103,992
	3	3	202	16,078	46,165	2,129	111	39	64,727
	4	2	1	892	6,130	1,375	149	16	8,565
	5	0	0	96	124	126	50	28	424
	6	0	0	1	0	4	0	1	6
	8	0	0	0	0	0	0	1	1
	Total	245	21,722	82,964	88,804	4,018	323	85	198,161*

* the total number of condominium is the single family condominium which has less than 9 bedrooms and less than 7 bathrooms

Table 67 Distribution of bedrooms/bathrooms of condominium in Los Angeles (percentage)

		Number of bathrooms							
		0	1	2	3	4	5	6	Total
Number of bedrooms	0	0.1	0.5	0.1	0.0	0.0	0.0	0.0	0.8
	1	0.0	7.2	2.2	0.2	0.0	0.0	0.0	9.5
	2	0.0	3.2	30.9	18.2	0.2	0.0	0.0	52.5
	3	0.0	0.1	8.1	23.3	1.1	0.1	0.0	32.7
	4	0.0	0.0	0.5	3.1	0.7	0.1	0.0	4.3
	5	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2
	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.1	11.0	41.9	44.8	2.0	0.2	0.0	100.0

Appendix 7-2 House and condominium data in Los Angeles (summary)

Table 68 Housing data of Los Angeles (detached houses, summary)

Variable	Unit	Number of obs.	Mean	Std. dev.	Min.	Max.	Percentiles (%)				
							10	25	50	75	90
Floor area	m²	85111	134.3	10.3	117.4	153.8	120.4	125.4	133.8	143.0	149.0
Distance1*	km	424	4.9	1.9	0.4	9.4	2.2	3.4	5.1	6.4	7.4
Distance2**	km	339	7.5	2.2	1.3	12.6	4.5	6.0	7.3	9.2	10.8
Distance3***	km	867	7.4	2.5	0.9	13.6	3.4	6.0	7.3	9.2	10.3
Price 1998	10 $/m²	2479	135.8	50.1	28.0	466.0	89.0	108.0	127.0	150.0	196.0
Price 2001		2985	173.0	63.9	1.0	627.0	110.0	137.0	163.0	194.0	249.0
Price 2004		4203	268.7	96.3	49.0	1,050.0	151.0	208.0	260.0	313.0	383.0
Price 2007		3763	410.4	122.7	26.0	1,774.0	248.0	356.0	406.0	457.0	536.0

* distance to the centre of CU submarket
** distance to the centre of LD submarket
*** distance to the centre of EL submarket

Table 69 Housing data of Los Angeles (condominiums, summary)

Variable	Unit	Number of obs.	Mean	Std. dev.	Min.	Max.	Percentiles (%)				
							10	25	50	75	90
Floor area	m²	14300	104.0	8.2	91.4	120.9	93.8	96.9	102.9	110.4	116.3
Distance1*	km	180	5.3	3.1	1.0	9.1	1.6	1.6	5.1	9.0	9.1
Distance2**	km	120	4.1	2.3	0.4	8.5	1.2	1.5	5.3	5.7	7.1
Distance3***	km	227	6.7	1.7	2.5	11.1	3.6	5.3	7.5	7.6	8.1
Price 1998	10 $/m²	457	110.4	40.8	19.0	396.0	67.0	84.0	103.0	126.0	161.0
Price 2001		756	145.9	58.0	30.0	536.0	88.0	118.0	140.0	168.0	214.0
Price 2004		1158	263.4	86.3	61.0	841.0	170.0	204.0	252.0	312.0	376.0
Price 2007		1028	387.8	90.5	158.0	968.0	311.0	336.0	368.0	417.0	495.0

* distance to the centre of CU submarket
** distance to the centre of LD submarket
*** distance to the centre of EL submarket

Appendix 7-3 Centres of commuting inflow in Los Angeles

Table 70 Top 50 major centres of commuting inflow in Los Angeles

Rank	Centres of commuting inflow	Tract ID	Commuting inflow (trip)
1	LAX	278000	49288
2	LA downtown	207710	47310
3	El Segundo	620003	42885
4	Vernon	532400	35466
5	Century city	267100	34863
6	LA downtown	207400	34286
7	LA downtown	207300	31548
8	UCLA	265301	30398
9	LA downtown	226000	29459
10	Long Beach airport	573500	27070
11	Beverly Hills	700800	25113
12	Rancho Dominguez	543305	24987
13	LA downtown	207500	24182
14	Commerce	532303	23830
15	Industry	408202	22857
16	Torrance (Zamperini field)	651101	22024
17	Vernon	206050	21612
18	Santa Monica	701900	21273
19	Universal city	311600	20424
20	Commerce	532304	20247
21	Torrance (Pueblo)	650901	19390
22	Long Beach	576000	17768
23	Warner center	137102	17585
24	LA downtown	207900	16649
25	Chatsworth	113303	16443
26	Pasadena	461900	16429
27	Pasadena	463600	16339
28	Palmdale	910100	15565
29	Industry	408211	14941
30	Santa Clarita	920107	14616
31	Santa fe springs	502700	14563
32	Warner center	134902	14128
33	Park La Brea	216300	13933
34	UCLA	265510	13839
35	Harbor Gateway	292000	13482
36	Van Nuys airport	127510	13360
37	Irwindale	404600	12654
38	East LA	203300	12571
39	La Mirada	504102	12464
40	Warner center	135112	12368
41	Santa fe springs	502800	12253
42	Torrance	650400	11977
43	Glendale	301800	11628
44	El Segundo	620501	11524
45	Santa Monica	701801	11468
46	Hidden Hills	800201	11235
47	Gardena	602900	11210
48	LA downtown	207100	11143
49	Bob hope airport	310500	11121
50	Beverly Hills	700400	11054

Appendix 7-4 Pajek data of commuting in Los Angeles (over 180 trip)

*Vertices 212
1 115201 0.0358537 0.3790275 0.5
2 115202 0.0358507 0.3789234 0.5
3 117406 0.0364574 0.3788241 0.5
4 113303 0.0354623 0.3790303 0.5
5 125500 0.0374112 0.378065 0.5
6 311600 0.0376594 0.3779911 0.5
7 139702 0.0361257 0.3778813 0.5
8 139701 0.0362118 0.3780605 0.5
9 191110 0.037961 0.3773631 0.5
10 190200 0.0377087 0.3774414 0.5
11 194100 0.0374503 0.3775683 0.5
12 267100 0.0368788 0.3769126 0.5
13 207500 0.0384394 0.3768832 0.5
14 207710 0.0383539 0.3768077 0.5
15 208800 0.0382101 0.3769677 0.5
16 226000 0.0384747 0.3766221 0.5
17 208904 0.0382788 0.3769512 0.5
18 207300 0.0384611 0.3768068 0.5
19 209101 0.0383262 0.3769316 0.5
20 209102 0.038302 0.3769017 0.5
21 209403 0.0382439 0.3768791 0.5
22 215100 0.0375371 0.3770091 0.5
23 216300 0.0374286 0.3769636 0.5
24 216400 0.0372637 0.3769476 0.5
25 700800 0.0371528 0.3770868 0.5
26 221820 0.0381231 0.3766284 0.5
27 222700 0.0381198 0.3765281 0.5
28 221900 0.0380946 0.3765881 0.5
29 224700 0.0381752 0.3765872 0.5
30 226410 0.0383465 0.3765556 0.5
31 226700 0.0383466 0.3764794 0.5
32 264101 0.0364501 0.3769555 0.5
33 265301 0.0366627 0.3770829 0.5
34 264302 0.0363689 0.3768391 0.5
35 265200 0.0367374 0.3770283 0.5
36 265510 0.0366858 0.3769361 0.5
37 265303 0.0365876 0.3770573 0.5
38 265304 0.0366087 0.3770611 0.5
39 265305 0.0366273 0.3770048 0.5
40 265600 0.0367733 0.3769448 0.5
41 265700 0.0368617 0.3770074 0.5
42 267200 0.0367446 0.37682 0.5
43 267300 0.0366329 0.3768106 0.5
44 267401 0.0365357 0.3768279 0.5
45 267402 0.0364728 0.3767826 0.5
46 267501 0.0365597 0.3767707 0.5
47 267900 0.0369265 0.3768615 0.5
48 269901 0.0370322 0.3765842 0.5
49 269902 0.0369881 0.3765705 0.5
50 271701 0.0369019 0.3766006 0.5
51 271702 0.0368388 0.376567 0.5
52 271802 0.0369559 0.3765252 0.5
53 276000 0.0371669 0.3759609 0.5
54 278000 0.0369799 0.3756638 0.5
55 276602 0.036786 0.375819 0.5
56 620003 0.0370843 0.3753417 0.5
57 277200 0.0372275 0.3757754 0.5
58 277400 0.0373006 0.3757348 0.5
59 293305 0.0379221 0.3739018 0.5
60 651101 0.0376208 0.3741711 0.5
61 297300 0.0378544 0.3731863 0.5
62 297600 0.0380717 0.3731226 0.5
63 576000 0.0389025 0.3736812 0.5
64 302202 0.038488 0.3778462 0.5
65 301800 0.0383863 0.377982 0.5
66 302501 0.0384894 0.3777964 0.5
67 302400 0.0383837 0.3777451 0.5
68 310200 0.0380159 0.3783938 0.5
69 311500 0.0376626 0.3781224 0.5
70 311800 0.0379319 0.3781704 0.5
71 401800 0.0433917 0.3775066 0.5
72 401901 0.0434633 0.3773539 0.5
73 401902 0.0433108 0.3773571 0.5
74 402802 0.043201 0.3767732 0.5
75 402901 0.0432153 0.3765977 0.5
76 404200 0.0417808 0.3776481 0.5
77 400800 0.0418083 0.3777814 0.5
78 404502 0.0416281 0.3774781 0.5
79 404600 0.0411107 0.3775002 0.5
80 407001 0.0409757 0.3769374 0.5
81 408202 0.0410888 0.3764977 0.5
82 407102 0.0409841 0.3767469 0.5
83 407200 0.0411395 0.3766263 0.5
84 407600 0.0412754 0.3766335 0.5
85 408101 0.0418799 0.3763468 0.5
86 408211 0.0415911 0.3762333 0.5
87 408102 0.0417156 0.3763524 0.5
88 408132 0.0415546 0.3764291 0.5
89 403303 0.0420831 0.3762822 0.5
90 408601 0.041156 0.3762797 0.5
91 408721 0.0416697 0.3760335 0.5
92 430900 0.040661 0.3777934 0.5
93 430801 0.0405406 0.3777913 0.5
94 431100 0.0408074 0.3777688 0.5
95 433901 0.040585 0.3769157 0.5
96 461500 0.0394746 0.3782135 0.5
97 463600 0.039476 0.3778369 0.5
98 461900 0.0394127 0.3779583 0.5
99 462300 0.0396107 0.3779578 0.5
100 463500 0.0396085 0.3778089 0.5
101 463400 0.0397394 0.377835 0.5
102 481901 0.0393403 0.3770638 0.5
103 482001 0.0392961 0.376891 0.5
104 502302 0.0401269 0.375899 0.5
105 502700 0.0400993 0.3757686 0.5
106 532500 0.0387154 0.3761752 0.5
107 532400 0.0388076 0.3763082 0.5
108 533300 0.0388951 0.3762015 0.5
109 533401 0.0389779 0.3762115 0.5
110 533501 0.0389109 0.3761214 0.5
111 533602 0.0389464 0.3760285 0.5
112 536101 0.0390881 0.3756595 0.5
113 543501 0.0381255 0.3745145 0.5
114 573600 0.0395872 0.3743385 0.5
115 573500 0.0393491 0.374249 0.5
116 574500 0.0398109 0.3739097 0.5
117 577200 0.0393583 0.373644 0.5
118 577603 0.0395522 0.3737058 0.5
119 599100 0.0371876 0.363205 0.5
120 599000 0.0376388 0.3690047 0.5
121 602103 0.0374594 0.3755005 0.5
122 602106 0.0374455 0.3754144 0.5
123 602200 0.0373393 0.3754495 0.5
124 602301 0.037374 0.3752641 0.5
125 602402 0.0374562 0.3752904 0.5
126 602501 0.0376605 0.375371 0.5
127 602502 0.0376172 0.3752474 0.5
128 602503 0.0376987 0.375247 0.5
129 620001 0.0370236 0.3754974 0.5
130 620002 0.0370243 0.3754149 0.5
131 620101 0.0368762 0.3754999 0.5
132 620102 0.0368953 0.3754198 0.5
133 620302 0.0369262 0.3751249 0.5
134 620400 0.0371721 0.3751316 0.5
135 620501 0.0373316 0.3750493 0.5
136 620521 0.0373697 0.3749278 0.5
137 620522 0.0372836 0.3749288 0.5
138 620602 0.0373752 0.3747702 0.5
139 620701 0.0372226 0.3748581 0.5
140 620702 0.0372411 0.3747701 0.5
141 620800 0.0371669 0.3749723 0.5
142 620902 0.0369845 0.3749839 0.5
143 621002 0.0370312 0.3748608 0.5
144 621101 0.037084 0.3747331 0.5
145 621201 0.0372068 0.3746324 0.5
146 621301 0.0372318 0.3744711 0.5
147 621321 0.0371559 0.3744668 0.5
148 650002 0.0376642 0.3749271 0.5
149 650601 0.0375161 0.3745545 0.5
150 650400 0.0376128 0.3745905 0.5
151 650602 0.03742 0.3745472 0.5
152 650800 0.0376357 0.3743807 0.5
153 650901 0.0378014 0.3745613 0.5
154 651001 0.0378363 0.3742115 0.5
155 651002 0.0377439 0.374232 0.5
156 651102 0.03754 0.3743125 0.5
157 651222 0.0374312 0.3742204 0.5
158 651302 0.037309 0.3741574 0.5
159 651400 0.037582 0.3740007 0.5
160 670003 0.0377521 0.3740373 0.5
161 670100 0.0378134 0.3739082 0.5
162 670407 0.0371581 0.373792 0.5
163 700300 0.0373409 0.3773186 0.5
164 700400 0.0372559 0.377204 0.5
165 700500 0.0372237 0.377288 0.5
166 700600 0.0370756 0.3773035 0.5
167 700902 0.0371308 0.3769921 0.5
168 701000 0.0370256 0.3769914 0.5
169 701301 0.0360989 0.3766554 0.5
170 701900 0.0362113 0.3764701 0.5
171 701400 0.0361321 0.3765486 0.5
172 701501 0.0362417 0.3766289 0.5
173 702000 0.0362897 0.3763873 0.5
174 702100 0.0363435 0.3763318 0.5
175 800201 0.0346449 0.3780583 0.5
176 137102 0.0353569 0.378259 0.5
177 800403 0.033311 0.3766394 0.5
178 800502 0.0345572 0.3769293 0.5
179 900101 0.0422594 0.3829142 0.5
180 910100 0.0403995 0.3831113 0.5
181 900502 0.0398876 0.3838359 0.5
182 900503 0.0401327 0.3837953 0.5
183 900604 0.0399012 0.3840501 0.5
184 900701 0.0395476 0.3838376 0.5
185 900705 0.0394013 0.3836004 0.5
186 901005 0.0392397 0.3839237 0.5
187 901006 0.0391579 0.3836831 0.5
188 900806 0.0395379 0.383997 0.5
189 901102 0.0389125 0.3836062 0.5
190 901205 0.0382881 0.3837868 0.5
191 901003 0.0387547 0.3840087 0.5
192 910000 0.0415885 0.3825744 0.5
193 910203 0.0393055 0.3828785 0.5
194 910204 0.0390522 0.3830583 0.5
195 910301 0.0387923 0.3833601 0.5
196 910302 0.0388071 0.3831865 0.5
197 910503 0.0398688 0.3825306 0.5
198 910603 0.0400483 0.3825304 0.5
199 910703 0.0403402 0.3825063 0.5
200 910710 0.0401653 0.3823593 0.5
201 920017 0.035969 0.3812264 0.5
202 920107 0.0355216 0.3813011 0.5
203 920019 0.0360743 0.3813154 0.5
204 920020 0.0363159 0.3815314 0.5
205 920030 0.0363254 0.3809211 0.5
206 920035 0.0365478 0.3809628 0.5
207 920037 0.0366672 0.3808902 0.5
208 920105 0.0349863 0.3815704 0.5
209 920103 0.0352693 0.383185 0.5
210 920329 0.035749 0.3808772 0.5
211 920335 0.0359975 0.3805203 0.5
212 920312 0.035952 0.3802996 0.5
*Arcs
1 2 39.6
3 4 28.5
5 6 34.8
7 8 28.35
9 10 29.25
11 12 30
13 14 28.5
15 16 29.4
17 18 57.6
19 18 47.85
19 16 41.4
20 18 40.8
20 16 44.55
21 18 30
22 23 38.25
24 25 30.3
26 27 76.5
28 27 90
29 27 129.75
30 16 36.6
31 16 27.3
32 33 31.2
34 12 29.1
35 33 101.85
35 36 39
33 36 35.85
37 33 133.5
37 36 45
38 33 102
38 36 36.75
39 33 55.5
36 33 51.6
40 33 33.45
41 12 27.75
42 33 31.95
42 12 29.25
43 33 35.85
44 33 40.35
44 12 38.1
45 33 33.75
46 33 41.25
47 12 29.85
48 33 35.85
49 33 41.25
50 33 32.7
51 33 68.85
52 33 27
53 54 37.5
55 54 36.6
55 56 36.75
57 54 48.45
58 54 31.35
59 60 27.75
61 56 31.5
62 63 30.45
62 56 58.5
64 65 28.95
66 67 28.05
68 6 29.1
69 6 34.35
70 6 28.35
71 72 41.25
71 73 27.75
73 72 81.75
74 75 27.6
76 77 45.75
78 79 27.6
80 81 31.35
82 81 30.6
83 81 28.95
84 81 37.65
85 86 28.5
87 81 31.35
87 86 34.5
88 81 45
86 89 29.25
90 81 31.2
91 86 70.5
92 93 28.35
92 94 27
95 81 27
96 97 37.65
98 97 28.95
99 98 28.5
99 100 35.7
101 100 35.1
97 14 27.75
97 98 43.35
97 100 60
102 103 35.55
104 105 27
106 107 27.3
108 107 34.35
109 107 33.75
110 107 28.05
111 107 37.95
112 107 36.6
113 60 34.5
114 115 37.35
116 115 33.6
117 63 32.25
118 63 27.75
119 120 29.25
121 54 29.1
122 54 35.1
123 54 28.8
123 56 30.6
124 54 37.8
124 56 33
125 54 32.25
126 54 48.6
127 54 38.25
128 54 33.75
129 56 39.75
130 56 45
131 54 37.95
131 56 53.25
131 132 31.5
132 56 38.25
133 56 40.35
134 56 30.6
135 56 32.85
136 56 36.75
137 56 42
138 56 37.35
139 56 31.5
139 135 27
140 56 45.75
141 56 41.85
142 56 27.75
143 56 29.25
144 56 57
145 56 30.75
146 56 41.25
147 56 33.75
148 56 28.5
149 56 49.5
149 150 28.35
149 60 34.5
151 56 27.75
152 153 30.75
153 60 30
154 60 27.75
155 60 36.6
156 60 27.75
157 60 32.1
158 56 27.75
158 153 31.35
159 60 37.5
160 60 41.25
161 60 37.5
162 56 27
163 25 27.75
164 25 28.5
165 12 27
165 25 35.55
166 25 30.6
25 12 30.6
167 25 30.6
168 25 38.7
169 170 32.25
171 170 29.7
172 170 27.6
173 170 38.1
174 170 39.6
175 176 27
177 178 47.25
179 180 34.5
181 180 30
182 180 33.75
183 184 33
183 180 37.5
185 180 43.5
186 184 33
186 180 30.75
187 184 35.1
187 188 32.1
187 180 45.75
189 180 33
190 191 30.75
192 180 33.75
193 180 51.75
194 180 30.75
195 180 30
196 180 28.5
197 180 33.75
198 180 27.75
199 180 27
200 180 41.25
201 202 32.25
203 202 48
204 202 30
205 202 30.75
206 202 33.6
207 202 34.5
208 209 29.25
208 202 42.75
210 202 30.75
211 175 34.8
211 202 60.75
211 212 36.9

Appendix 7-5 Modes of transportation to work in Los Angeles

Table 71 Principal modes of transportation to work in Los Angeles

Means of Transportation to Work	2000 Census		1990 Census	
	Number	Percent	Number	Percent
All Workers Age 16 & over	3,858,750	100.00%	4,115,248	100.00%
Car, truck, or van	3,296,964	85.44%	3,524,185	85.64%
Drove alone	2,714,944	70.36%	2,884,615	70.10%
Carpooled	582,020	15.08%	639,570	15.54%
Public transportation	254,091	6.58%	267,210	6.49%
Bus or trolley bus	234,662	6.08%	262,732	6.38%
Streetcar or trolley car	1,946	0.05%	1,320	0.03%
Subway or elevated	6,200	0.16%	574	0.01%
Railroad	7,660	0.20%	403	0.01%
Ferryboat	366	0.01%	344	0.01%
Taxicab	3,257	0.08%	1,837	0.04%
Motorcycle	6,758	0.18%	19,838	0.48%
Bicycle	24,015	0.62%	25,966	0.63%
Walked	113,004	2.93%	133,927	3.25%
Other means	29,275	0.76%	31,325	0.76%
Worked at home	134,643	3.49%	112,797	2.74%

Source: US Census bureau

Appendix 7-6 Location of centres of spatial submarkets in Los Angeles

Table 72 Location of centres of spatial submarkets in Los Angeles

Spatial housing submarket	Location of centre	X*	Y*
CU	Central point between Century city, UCLA, and Beverly Hills	369256 m	3769694 m
LD	Centre of LA downtown block	384764 m	3768846 m
EL	Centre of El Segundo block	371707 m	3752426 m

* NAD_1983_UTM_Zone_11N (Projection: Transverse_Mercator)

Appendix 7-7 Regression result in Los Angeles

Table 73 OLS Regression of house price on distance to centre in Los Angeles (CU)

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	97		96		125		106	
F	40.37		10.38		22.54		17.84	
Prob > F	0.000		0.002		0.000		0.000	
R-squared	0.298		0.099		0.155		0.146	
Adj R-squared	0.291		0.090		0.148		0.138	
Root MSE	61.4		73.5		111.4		125.8	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-21.0	326.5	-13.7	382.3	-24.9	590.7	-24.5	780.6
Std. Err.	3.3	16.9	4.2	22.3	5.2	27.9	5.8	31.3
t	-6.4	19.3	-3.2	17.1	-4.8	21.2	-4.2	25.0
P>t	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-27.6	292.8	-22.1	338.0	-35.2	535.4	-36.1	718.7
Interval]	-14.4	360.1	-5.3	426.6	-14.5	645.9	-13.0	842.6

Table 74 OLS Regression of house price on distance to centre in Los Angeles (LD)

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	53		66		122		98	
F	3.96		1.2		15.84		20.96	
Prob > F	0.052		0.277		0.000		0.000	
R-squared	0.072		0.019		0.117		0.179	
Adj R-squared	0.054		0.003		0.109		0.171	
Root MSE	22.4		45.5		88.9		109.5	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-2.7	136.4	-3.0	166.6	-14.6	331.4	-21.4	570.1
Std. Err.	1.4	10.5	2.7	20.6	3.7	29.7	4.7	36.6
t	-2.0	13.0	-1.1	8.1	-4.0	11.2	-4.6	15.6
P>t	0.052	0.000	0.277	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-5.4	115.4	-8.4	125.3	-21.9	272.7	-30.7	497.4
Interval]	0.0	157.4	2.4	207.8	-7.4	390.1	-12.1	642.8

Table 75 OLS Regression of house price on distance to centre in Los Angeles (EL)

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	192		188		230		257	
F	36.57		19.39		43.29		44.72	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.161		0.094		0.160		0.149	
Adj R-squared	0.157		0.090		0.156		0.146	
Root MSE	46.0		69.1		108.2		101.7	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-8.0	207.3	-8.7	255.4	-18.3	434.4	-17.3	563.9
Std. Err.	1.3	10.2	2.0	15.1	2.8	21.7	2.6	20.7
t	-6.1	20.3	-4.4	17.0	-6.6	20.0	-6.7	27.3
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-10.5	187.1	-12.6	225.7	-23.8	391.7	-22.3	523.2
Interval]	-5.4	227.5	-4.8	285.1	-12.8	477.2	-12.2	604.6

Table 76 OLS Regression of condominium price on distance to centre in Los Angeles (CU)

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	37		33		67		43	
F	63.23		39.89		24.86		56.99	
Prob > F	0.000		0.000		0.000		0.000	
R-squared	0.644		0.563		0.277		0.582	
Adj R-squared	0.634		0.549		0.266		0.571	
Root MSE	20.7		31.0		86.8		69.7	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-8.2	189.7	-11.1	269.1	-16.9	455.2	-28.1	673.7
Std. Err.	1.0	6.2	1.8	11.1	3.4	19.8	3.7	24.9
t	-8.0	30.6	-6.3	24.3	-5.0	23.0	-7.6	27.0
P>t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[95% Conf.	-10.2	177.1	-14.7	246.5	-23.6	415.7	-35.6	623.4
Interval]	-6.1	202.3	-7.5	291.7	-10.1	494.8	-20.6	724.1

Table 77 OLS Regression of condominium price on distance to centre in Los Angeles (LD)

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	10		28		39		43	
F	1.58		7.35		7.21		29.73	
Prob > F	0.244		0.012		0.011		0.000	
R-squared	0.165		0.220		0.163		0.420	
Adj R-squared	0.061		0.191		0.141		0.406	
Root MSE	28.0		33.5		78.1		67.6	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-5.0	138.0	-7.6	202.0	-14.8	371.6	-24.8	603.0
Std. Err.	4.0	17.5	2.8	11.7	5.5	27.1	4.6	22.7
t	-1.3	7.9	-2.7	17.3	-2.7	13.7	-5.5	26.6
P>t	0.244	0.000	0.012	0.000	0.011	0.000	0.000	0.000
[95% Conf.	-14.1	97.6	-13.3	177.9	-25.9	316.8	-34.0	557.2
Interval]	4.2	178.4	-1.8	226.0	-3.6	426.4	-15.6	648.8

Table 78 OLS Regression of condominium price on distance to centre in Los Angeles (EL)

	Price 2000		Price 2003		Price 2006		Price 2009	
Number of obs	33		51		68		75	
F	6.53		3.7		5.56		19.79	
Prob > F	0.016		0.060		0.021		0.000	
R-squared	0.174		0.070		0.078		0.213	
Adj R-squared	0.147		0.051		0.064		0.203	
Root MSE	44.8		55.2		106.1		75.1	
	Distance	Constant	Distance	Constant	Distance	Constant	Distance	Constant
Coef.	-12.1	215.5	-8.4	237.9	-17.6	394.6	-23.1	571.5
Std. Err.	4.7	32.9	4.3	29.7	7.5	51.6	5.2	36.3
t	-2.6	6.6	-1.9	8.0	-2.4	7.6	-4.5	15.7
P>t	0.016	0.000	0.060	0.000	0.021	0.000	0.000	0.000
[95% Conf.	-21.7	148.4	-17.1	178.1	-32.5	291.5	-33.5	499.1
Interval]	-2.4	282.6	0.4	297.6	-2.7	497.7	-12.8	643.8